MODERN PLASTICS

E. F. LOUGEE, EDITOR • DR. G. M. KLINE, TECHNICAL EDITOR • C. A. BRESKIN, PUBLISHER

JUNE 1938 VOLUME 15 NUMBER 10

• GENERAL INTEREST

• TECHNICAL SECTION

• NEWS AND FEATURES

Covercolor this month NASSAU ORANGE (Created by Textile Color Card Association)

Published the 5th of each month by Breskin & Charlton Publishing Corporation, 425 Fourth Ave. New York N. Y. Telephone Ashland 4-0655. Western office, 221 N. La Salle St., Room 616, Chicago Ill. Telephone Randolph 6336. Publication office, Twentieth and Northampton Sts., Easton, Pa. Also publishers of Modern Packaging, Packaging Catalog.

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Subscription price $5.00 per year in United States, its possessions and Canada. All other countries, $6.00 per year. Price this issue, 50c per copy.
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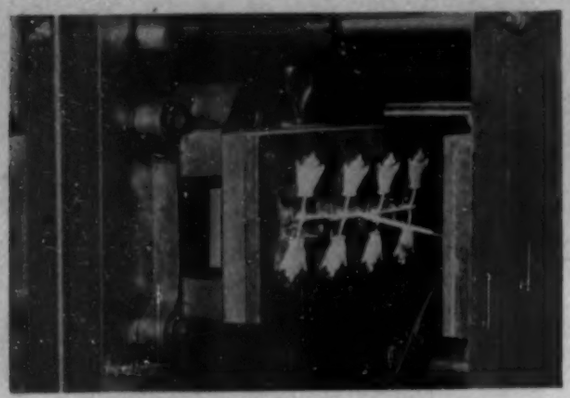
Printed in U. S. A. Acceptance under the Act of June 5, 1934, at Easton, Pa., authorized Nov. 24, 1936. Back numbers dated 3 months or more preceding current issue, when available, $1.00 per copy.

HENRY DREYFUSS

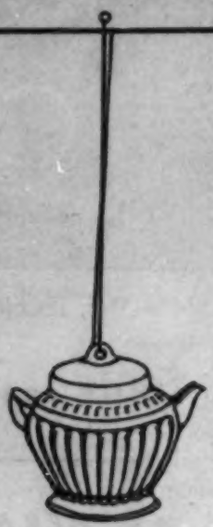
• NEXT MONTH

The new streamlined "20th Century Limited" between New York and Chicago is scheduled to make its first trip June 15. In presenting the fleet of four trains, the New York Central System will put at the service of the public what is believed to be the most modern and luxurious equipment ever constructed for railroad service. The public cars, designed by Henry Dreyfuss in cooperation with N. Y. C. Engineering Equipment Division, will be pictured and described in our July issue.

REED-PRENTICE *raises the curtain on the Plastic Future!*



Courtesy Geo. F. Berkander, Inc., Providence, R. I., where four Reed-Prentice machines are used.



These shade pulls and tie backs are available in a variety of pastel shades. Pulls are equipped with cord, tie backs with push pins.

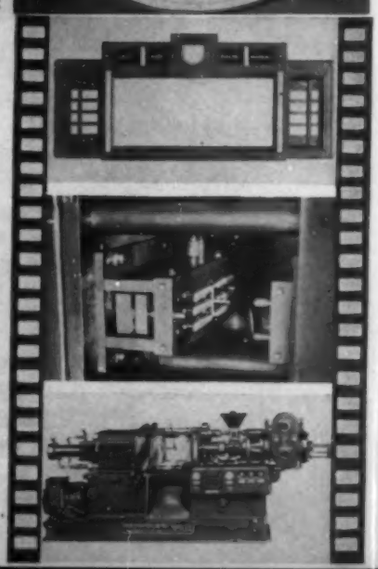
in now offering the No. 10-A 2 oz. and No. 10-B 6 oz. PLASTIC INJECTION MOLDING MACHINES

SPECIFICATIONS:	#10-A Machine	#10-B Machine
Capacity of Hopper Slide	7 c/in Gran. Material 2¾ c/in moulded 2 oz. moulded	20 c/in Gran. Material 8 c/in moulded 6 oz. moulded
Estimated shots per hour	up to 300 to 400 varying with type of product, 32 lbs. per hr.	up to 300 to 400 varying with type of product, 45 lbs. per hr.
Pressure per sq. in. on material	2000 to 26,000 lbs. regulated through Pressure Valve	2000 to 20,000 lbs. regulated through Pressure Valve
Maximum injection area of mould capacity	24 sq. in. at maximum pressure 26,000 lbs. 35 sq. in. at 17,500 lb. pressure	40 sq. in. at pressure 20,000 lbs. 50 sq. in. at pressure 17,000 lbs.
Diameter of plunger	1¾"	2½"
Stroke	7"	12"
Speed of plunger (continuous speed)	120" per minute	176" per minute
Approximate power consumption for heating unit	1 to 2½ KW	1½ to 2½ KW
Size of die plates	18" x 20"	18" x 20"
Capacity of Feed Hopper	20 lbs.	35 lbs.
Space between bars	12" x 12"	12" x 12"
Space center to center of bars	14½" x 14½"	14½" x 14½"
Die opening	8"	8"
Maximum die space	18"	18"
Minimum die space	7"	7"
Locking pressure Toggle Mechanism	85 tons	85 tons
Weight, exclusive of drive motor and control, approximately	10,000 lbs.	12,000 lbs.
Motor recommended	10 HP 1200 RPM 60 cycle 1500 RPM 50 cycle	20 HP 1200 RPM 60 cycle
Floor space	147" x 41½"	180" x 41½"

Typical shots from test mould designed to check capacity and surface area. [6¾ oz.: 47 sq. in.]

Available . . .
A MOVIE→
(6 m/m in Kodachrome)

10-A Reed-Prentice Plastic Injection Molding Machine . . . construction . . . features . . . operation, etc. This will gladly be loaned to societies, clubs, etc. interested in Plastic Injection Molding Equipment.



REED-PRENTICE CORP.
Main Office & Works—Worcester, Mass.—N. Y. Office—75 West St.

OVER 140 REED PRENTICE INJECTION MOLDING MACHINES NOW IN SERVICE

MODERN PLASTICS
JUNE 1938 VOLUME 15 NUMBER 10

WHAT IS A PROBLEM?

by J. F. BARNES AND J. O. REINECKE* (WHOM YOU SEE ABOVE)

"YOU SEE, OUR PROBLEM IS DIFFERENT. YOU couldn't do anything for us unless you were actually in the beauty equipment business."

That was one manufacturer's objection to engaging an industrial designer, when we spoke to him recently about restyling his line. One manufacturer's objection?—Substitute for "beauty equipment" the words casket, automobile, chair, lamp, radio, etc., and you have a verbatim report of many a manufacturer's remarks to the designer.

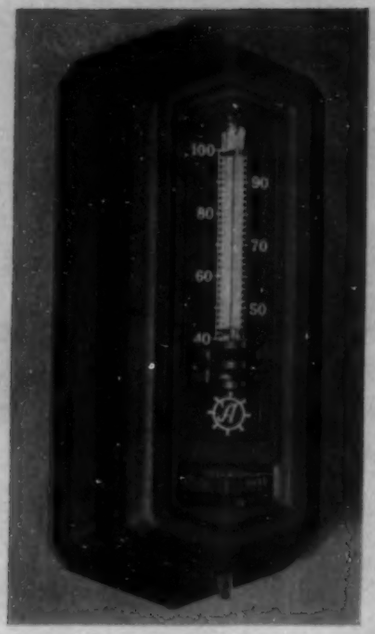
True enough, we don't know as much about beauty equipment as the man who has been manufacturing it for fifteen years. We don't have the information he has about the industry in general. Nor do we have that preoccupation with problems which loom large to him, but which are actually routine details, clearly seen as such by anyone with a disinterested viewpoint.

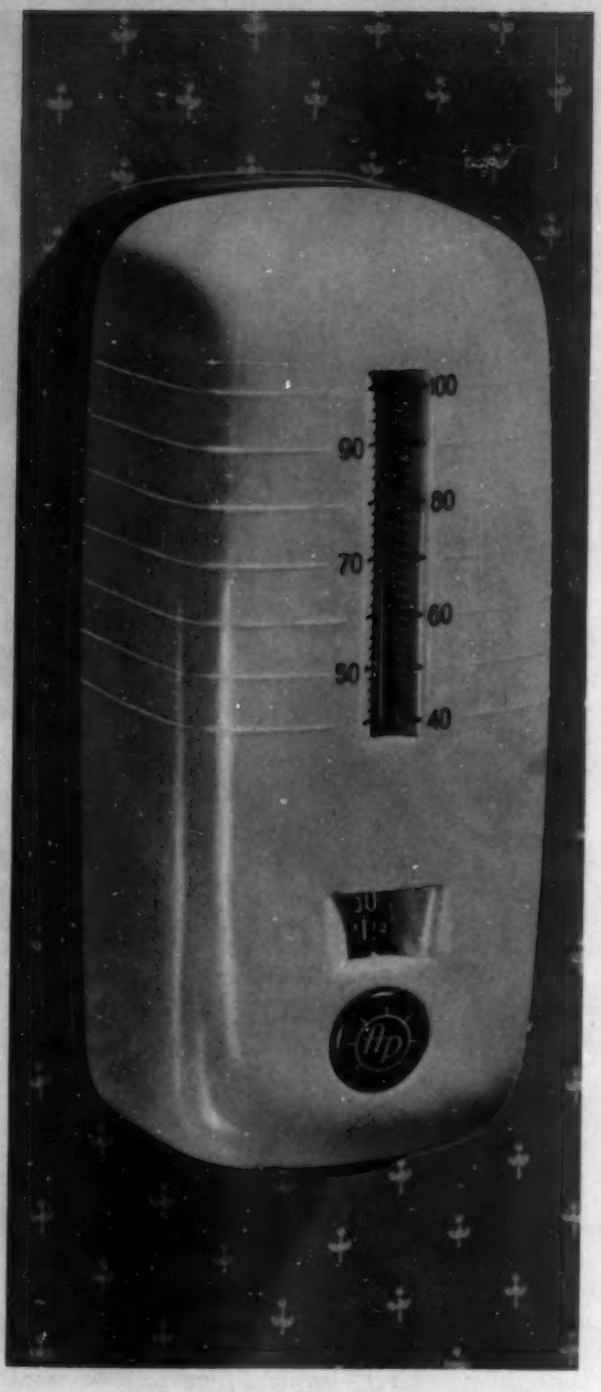
We have never, for that matter, been in the thermostat business. We couldn't, if we were pinned down, distinguish a bimetal from a magnetic blowout. But we have been in the industrial design business long enough to know something about *that*. Long enough to see that every manufacturer has a problem, and that all manufacturers have the same problem: converting raw materials into a finished product, and marketing that finished product profitably. Thermostat or pipe organ, there are limitations—"definitions" we prefer to call them—within which we have to work. Once those are clearly recognized, the rest is a matter of mechanical skill. That is what makes it possible for any industrial designer—Teague, Dreyfuss, Loewy, or Adams—to solve problems in industries they learned of the day before yesterday; because the essential problems are the same, non-essential ones are merely details.

One of our recent assignments in the thermostat field was the redesign of the Automatic Products Company's A-P Thermostat.

As long as there have been thermostats, there have been slots on the sides of them. The reason for these, it

* Industrial designers





seems, is that there is a bimetallic strip within the device which detects temperature changes. Some kind of ventilation is necessary to get room air through the housing and into contact with this strip. *Why* this ventilation took the form of slots, no one has ever explained. Possibly, the first thermostat ever manufactured used this method; forever afterward a thermostat design began with louvers in the side.

The original A-P thermostat was no exception to the rule. The drawn brass housing was honeycombed with interstices, unattractive in themselves and furthermore permitting full view of the thermostat's innards from practically any angle. Our immediate resolve was that, no matter what form the device might finally take, eliminating those louvers was a "must."

Various improvements were to be incorporated in the engineering of the A-P; more sensitive detection, more positive control, heat anticipation, etc. Our general problem, therefore, was to express this greater efficiency through exterior styling. Two specific requirements to be met were: greater legibility of the thermometer and greater accuracy in adjusting the thermostat's temperature control.

Add to the engineering requirements our own demands of good form and proportion, simple decoration and unassuming color harmony, and you have a complete statement of the problem.

Elimination of the louvers was the crux of that problem. With a housing unmarred by grill work and perforations, we could work unhampered on three-dimensional styling.

Eliminating the louvers, of course, presented a corollary question: how could we obtain proper circulation of air around the bimetallic strip?

Above, at the left, is the old A-P thermostat with a drawn brass case finished in bronze. Note the absence of louvers, or side slots, in the redesigned plastic model directly above. On the opposite page we picture the new A-P thermostat disassembled, showing the four molded parts beside an assembled unit. Top left: base plate, and immediately below, is the base showing the two female bosses at the top and the single male boss at the bottom, which secure the housing. Base, base plate and temperature-control wheel are gold-brown Bakelite with ivory numerals brushed into the wheel; the Tenite housing has brown brushed-in numerals. Molded by Chicago Die Mold Mfg. Co.

To begin with, we had previously determined upon a molded plastic housing. Working in conjunction with Mr. Pawelsky, chief draftsman of Automatic Products Company, we were able to develop a method of attaching such a housing to the panel that holds the mechanism. Three bosses on the base and the interior of the housing attach it securely to the panel, and at the same time provide a practically continuous vent which allows adequate air circulation—better, in fact, than the old method, the manufacturer asserts. The housing would need flexibility to snap onto the base, and was to be a light color; we therefore specified an acetate material which could furthermore be injection molded. The base was to be brown phenolic.

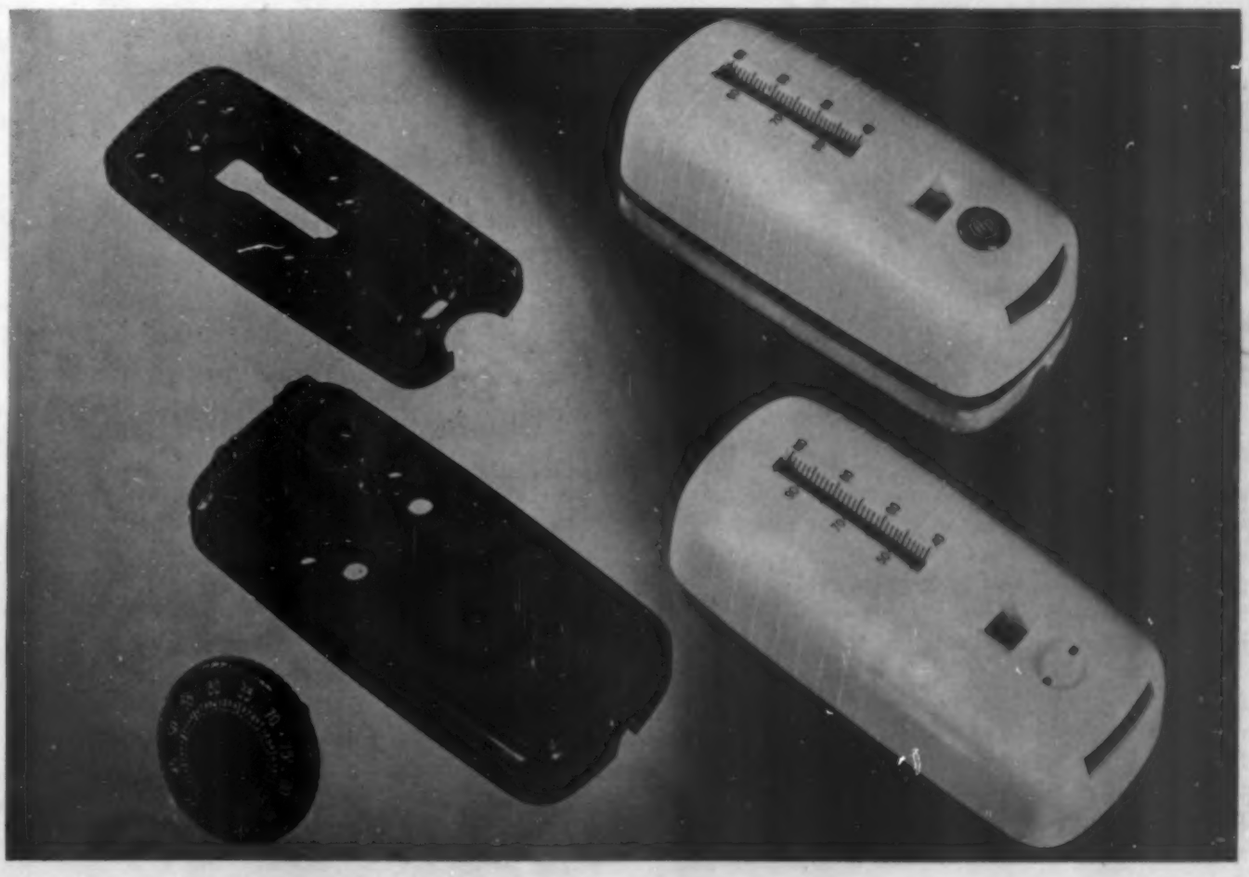
The solid housing has further advantages; it helps to minimize the collection of dust on the delicate mechanism within, and it eliminates the possibility of electric shock, a very real factor since some models operate on high voltage.

Eliminating the grillwork was made commercially possible and profitable through a molded plastic. The new thermostat, more efficient and more attractive, was produced for approximately the same cost as the old. The new housing also has the qualities of plastics—smooth, tactilely pleasant surface, permanent finish, attractive color and adaptability to restrained ornament. Once we had determined the construction to eliminate the louvers, the treatment of the other components was greatly facilitated. We fulfilled the engineering requirements on the thermometer by recessing the tube and bringing it closer to the scoring, making it easier to read. We fulfilled our own, because recessing the tube eliminated the screws and straps used on the old model.

Adjustment of the heat control on the previous model has been confined to a range of about thirty degrees, with the scale only approximately graduated. The new heat control is a molded plastic wheel providing adjustment from 40 deg. to 90 deg., with every degree between clearly marked and numbered.

The final step in styling the A-P was the choice of colors. This was determined by the arrangements already existing in homes. Good thermostats, like good manners, should be apparent but not obvious. For this reason, neutral ivory was chosen for the housing, while a golden brown phenolic base which would absorb the shadow cast by the offset housing was selected. These colors were chosen as best harmonizing with each other and with the color schemes of most homes.

Thus, the story of the general and specific definitions governing the design of the new A-P thermostat comes to an end. You will kindly excuse us now, because we have an appointment with a man who wants us to design his washing machine but doesn't know if we can because his problems are different.



Smooth, rounding surfaces in this cabinet, designed by Isamu Noguchi, are economically obtained by molding. Molded of Bakelite by Chicago Molded Products Corp. and Kurz-Kasch, Inc.

RADIO NURSE

This sensitive device, which can be plugged into any convenience outlet, reports instantly any disturbance or sound in the sick-room or nursery

THE "RADIO NURSE," A NEW ZENITH PRODUCT, is an extremely sensitive sound transmitting device, consisting of two small units. One of these is called the "Guardian Ear," and will pick up even the slightest sound in the room in which it is placed and make it audible, considerably amplified through the other unit—the "Nurse" proper which may be placed in any other part of the factory, house, or apartment. Both units become operative when simply plugged into an ordinary light socket, no wired connection being necessary.

The "Ear" which is only six inches high and four inches wide is in an ivory-finished case. The "Nurse" proper is an oval-shaped object, designed by Isamu Noguchi, Japanese sculptor, under instructions from Commander E. F. McDonald, Jr., president of the Zenith Radio Corporation, "to create a device which will be simple, beautiful and at the same time distinctively different from any inter-communicating set or radio now in use." It is $8\frac{1}{2}$ inches high and 6 inches wide.

Principal uses for the new device, as seen by Zenith officials, will be in the care of children and invalids. With the "Ear" unit placed in the nursery, a mother can plug in the "voice" unit in any other room in the house in which she may be and instantly hear every sound made in the nursery, a cry, a window or door opening, or, so sensitive is the device, even the child's breathing. Placed beside an invalid's bed, it permits transmission of requests without the need of the patient changing position in bed. It can also be used as a burglar alarm or for scientific eavesdropping. The ticking of a pocket watch placed near the "Ear" sounds through the "Nurse" like the ticking of a Big Ben, although the tick of the watch is inaudible to those standing in the room where the "Ear" is placed.

VISUAL PRESENTATION

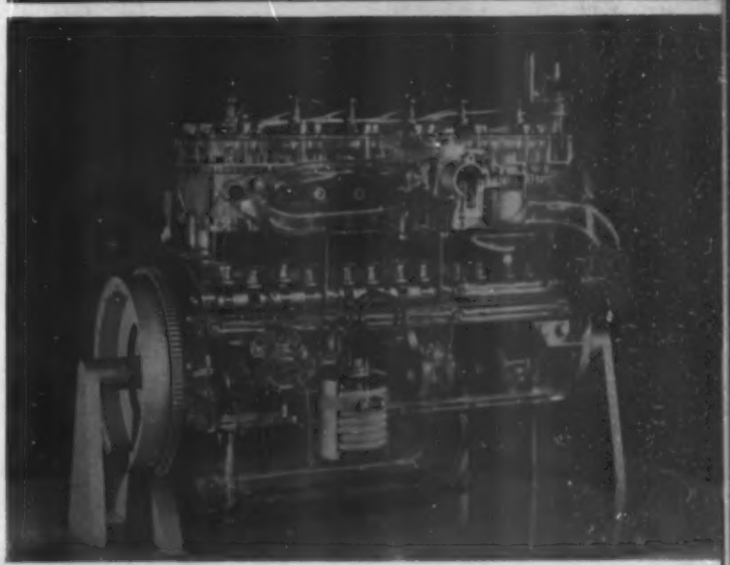
Transparent housings permit an unobstructed view of internal mechanical operations

SO MANY PRODUCTS HAVE INTERNAL MECHANisms upon which their successful operation depends that it is difficult to demonstrate their principal features without taking them apart. Once apart, it is even more difficult to show how they work. That is why the Norton Door Closer Company has had transparent models of their product made to show just how it is constructed and how it works in actual use. Besides giving a perfect visual demonstration, the model weighs but half as much as the door closer in metal. One of these models is pictured below. Stricker-Brunhuber Corp., mechanical developers, machined the models from solid blocks of water-clear methyl methacrylate resin.

General Shaver Corp., makers of the Remington Rand Electric Close Shaver, provide dealers with a transparent demonstration model packed in a leather covered, chromium trimmed case which they can eventually sell if they so desire. Its transparent casing of cellulose acetate gives the prospective purchaser an opportunity to see just how the tiny motor actuates the cutting mechanism before he buys.

The Wanderer 27 liter engine, pictured at the right, as exhibited at the International Motor Show held in Berlin from Feb. 18 to Mar. 6, this spring. It was called the Glass Engine because it was completely covered by a transparent acrylic resin housing which permitted an unobstructed view of the operating parts within. Pistons, valves, cam and timing were all visible as they moved slowly in their regular cycle.

Plastic models of the sort shown here can be machined in small quantities or if production warrants, they may be molded in the conventional way.

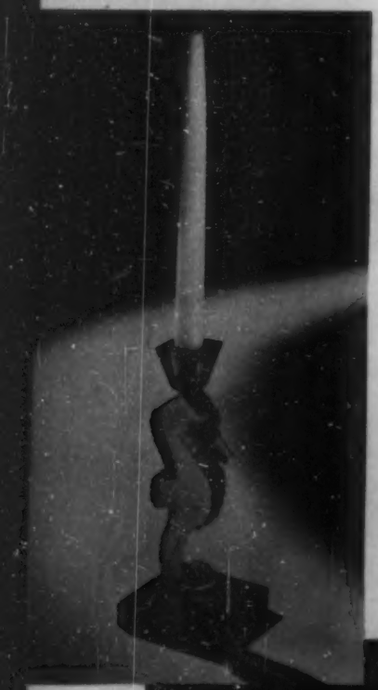


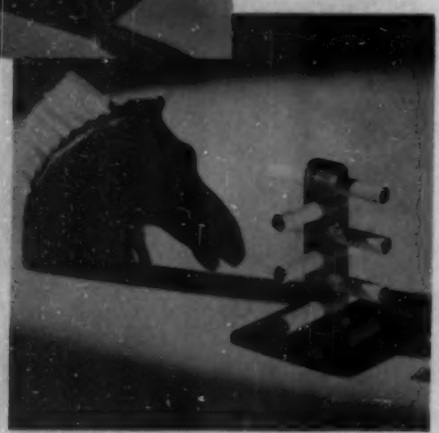
Molded Lumarith, a cellulose acetate plastic made by Celluloid Corp., is used for the transparent housing of the Remington Rand Electric Close Shaver, while the Wanderer Engine exhibited in Germany is encased in Plexiglas, an acrylic resin made by Röhm & Haas. The Norton Door Closer, at the left below, is fabricated by Stricker-Brunhuber Corp. from Lucite, a methyl methacrylate resin made by du Pont

JUNIOR ACHIEVEMENT

by EVE MAIN

A national organization created and sponsored to help young people help themselves





These amazing designs are created, fashioned and sold, under the guidance of experienced designers and craftsmen, by youngsters averaging seventeen years of age. From the transparent sea-horse candleholder at the left to the modern chessmen below, remarkable ability in handling cast resins is shown. Transparent material is combined with opaque, and colors are chosen with an appreciation of contrast and harmony seldom seen in commercial production

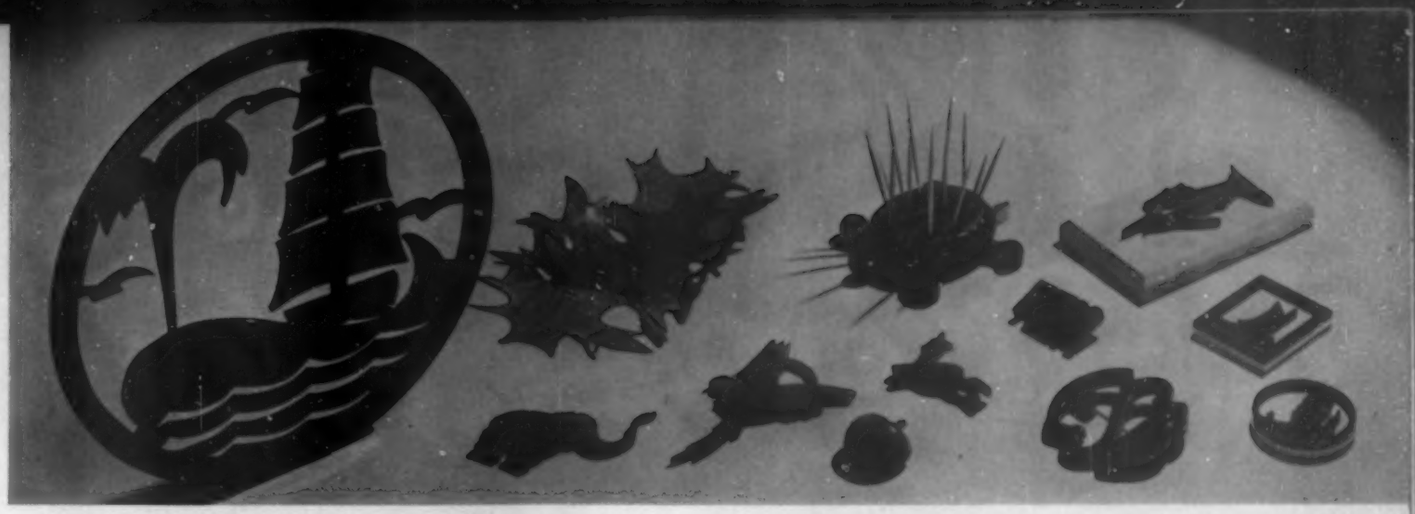
THAT CAST RESINS, BEAUTIFUL IN THEMselves, may be enhanced in decorative value by carefully planned design—influenced by professionals—skilled craftsmanship and intelligent handling of the material, is being ably demonstrated by groups of boys and girls, members of Junior Achievement corporations.

The Junior Achievement plan was inaugurated some nineteen years ago by Horace A. Moses, head of the Strathmore Paper Company, for the purpose of making it possible for young people to gain experience in business and economics through actual practice in work. His idea was to organize groups of boys and girls from 16 to 21 years of age along the lines of a regular manufacturing concern, miniature in size but complete in every phase. Not only did he work out the details of the project but with several business men put $250,000 into it to help organize and guide the companies. Other sizable donations were immediately forthcoming from people who recognized the value to industry of such educational methods, and today the companies have spread from the New England city where they started, as far west as Ohio.

Working under the supervision of Metropolitan Junior Achievement, Inc., in New York City, some fifty of these miniature corporations are turning out salable merchandise of superior quality and workmanship. Many of them have chosen plastics as a medium for their work and a surprising number of young people are fast becoming expert in fabricating cast resins into useful articles both unusual in design and well executed. Indeed, the remarkable skill exhibited in some of the finished pieces might well bring a blush to fabricators of wider experience and incite their interest in improved design.

In planning their products, these companies have the benefit of the guidance of such well-known designers as George Blow, of De Vaulchier, Blow & Wilmet, Inc.—

CATALIN



who serves as chairman of the Craft Advisory Committee of the local headquarters—Henry Dreyfuss, Russell Wright, and Virginia Hamill, among others. These public spirited citizens give generously of their time in an effort to promote recognition of the component parts that go into the making of good design. Craft instructors from the various units visit headquarters periodically to receive training and suggestions for fabricating new items, which they pass along to the members of the corporations they represent.

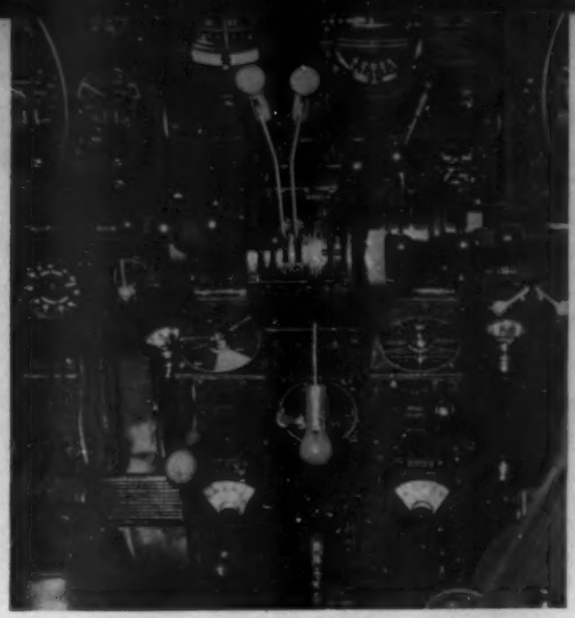
In this way, these youngsters, many of whom are potential designers and craftsmen of the future, are being given a basic understanding of these new materials which they might gain in no other way. It is obvious from the things they have turned out that their appreciation and understanding of plastic design will be reflected in the merchandise of the future, when through the experience gained they become eligible for positions in the business world where quantity production is a natural thing. Already, many manufacturing concerns, recognizing the ability of these young people, have taken advantage of their training to place them in jobs of responsibility. Naturally, Junior Achievement companies do not compete with big business, but focus their attention on out-of-the-ordinary, and one-of-a-kind-things that the average fabricator, unless he secured a quantity order, couldn't duplicate profitably. Book ends in clear, transparent cast resin carved and turned into the shape of a blow fish in action; tall candlesticks of the same material with the candle holder supported by a sea-horse accurate in detail; backgammon sets in color; place card holders, some of which are designed to hold cigarets; cigaret cases with copper or pewter base and transparent cast resin top, one style having a groove along the top edge for insertion of a small sponge which may be dampened to keep cigarets moist; ash trays in sets or singly in many different colors; brooches, clips and buttons in a variety of sizes, shapes and colors, many of them carved with the customer's initials—all these and more, accomplished with an unique attention to detail.

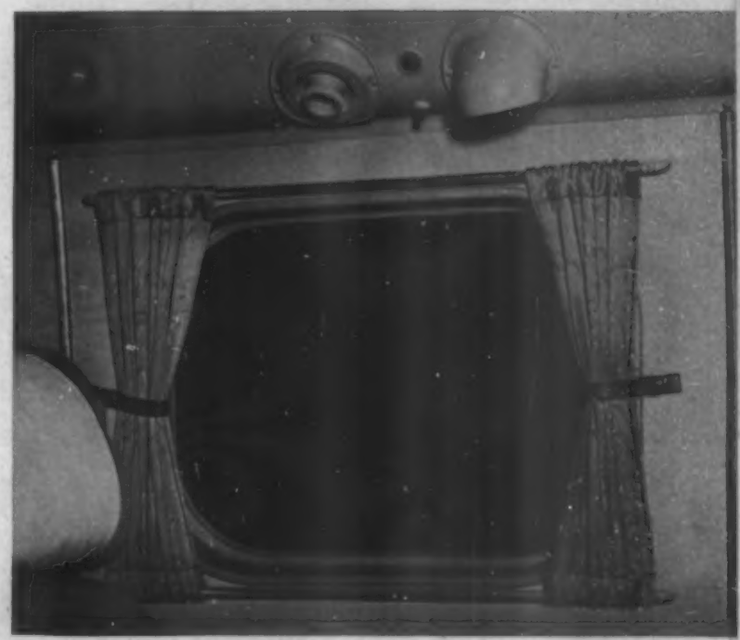
Not only are these young people demonstrating by example the infinite potentialities of these materials, but they are at the same time introducing plastics into homes where they have never before been recognized as desirable for highly decorative pieces. Of course, they have an advantage over most fabricators (*Please turn to page 64*)

The 12 in. cut-out plaque above indicates the scope of the work of Junior Achievement as do the small items of initialed jewelry and table decorations. The book ends below, depict (left) an opaque horse and rider in action against a translucent cast resin sheet of pale green, and (right) transparent blowfish in decorative design

Plexiglas nose, 38 in. by 25 in. and 14 in. deep, shields the directional loop radio antenna on all Northwestern Airlines' Sky Zephyrs. It admits radio signals to the loop yet provides an electrostatic shield and is reported to resist hail and similar bruising better than the metal it replaced

RIGHT ON THE NOSE





THE LOCKHEED SKY ZEPHYRS PLACED IN SERvice late last year by Northwest Airlines are among the world's fastest air transports. With a cruising speed of 230 miles an hour, they provide safe and rapid transportation between the Twin Cities and Chicago.

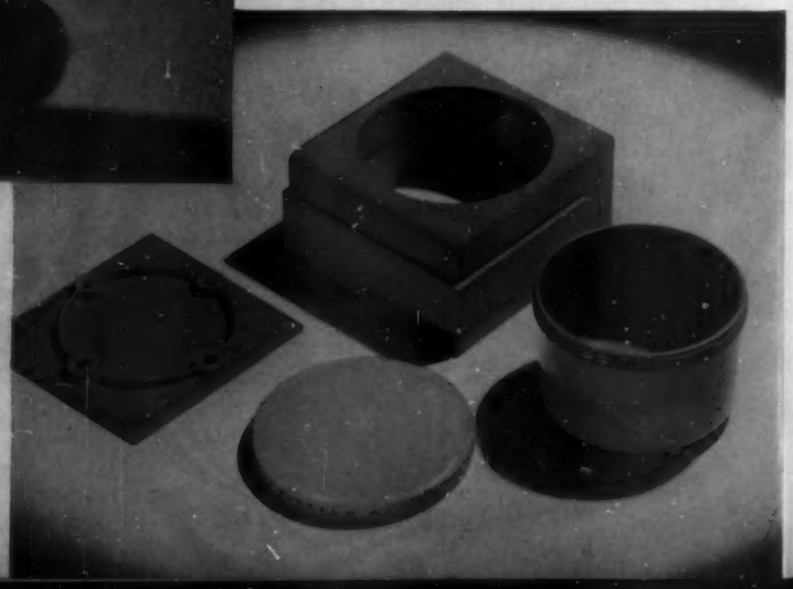
Equipped with every modern device they quite naturally use plastics in diversified ways, most interesting of which is the transparent nose pictured on the opposite page. Its primary purpose, of course, is to house the directional loop radio antenna in a dielectric fairing to avoid static. But the transparency of the material adds to the attractive appearance of the plane and the loop antenna installation.

Most modern radio equipment is all important in air transportation and this departure from conventional loop antenna installation has attracted world-wide attention. Mounting the loop in the nose instead of underneath the fuselage adds two miles an hour to the speed of the plane—a real factor in commercial operation. The plastic nose admits radio signals to the loop without perceptible loss of signal strength yet provides an electrostatic shield not possible with other materials.

The transparent plastic used for the loop antenna shield is an acrylic resin and is drawn in one piece from $^{3}/_{16}$ in. flat sheets. This same type of plastic is often used for cockpit housings, and for window panes. Molded phenolics, acetates and ureas find many uses in these modern ships of the sky, some of which are identified in the caption which follows:

The illustrations on this page reading clockwise show 38 knobs and control handles of plastic materials in the cockpit; a stewardess panel with telephone hand set, air control knobs and switch button; chair adjustment knob; aisle of ship with safety-glass windows; ventilator nozzle unit, reading light fixture, call button, light switch plunger, 4 curtain rod supports, and window frame. Plastics are chosen wherever possible because of their comparatively light weight

Raymond Loewy, in creating this family of packages for Jacqueline Cochran cosmetics, combines glass, metal and plastics for pleasing continuity of design. The plastic cream jar, pictured in three sizes on the opposite page, is molded in four parts, seen below. The inner jar—or cream container, is Coltrock, a special gray plastic material impervious to moisture and unaffected by cosmetics. The outer casing and base are of Beetle to match, while gray letters encircle the ivory cap. Beetle closures on the glass bottles carry the identifying design of a whirling propeller as do the metal cases and rouge box at the left



WINGS TO BEAUTY

by VIVIAN VORSANGER

Cosmetic packaging in which material, color and design are smartly combined

SINCE DECEMBER 1932, WHEN JACQUELINE Cochran received her private pilot's license, she has been making aviation history. *U. S. Air Services* gives her a score of six new records and third place in the Bendix Race during the past six months.

In October 1935, Miss Cochran opened her first beauty salon at 700 No. Michigan Avenue in Chicago. In June of 1936, she opened another at the Ambassador Hotel in Los Angeles and both of these ventures met with immediate success.

Encouraged by the unusual acceptance of her product, she has experimented in her laboratory during the past four years and finally developed a line of beauty creams and aids that she feels are superior to anything on the market. This accomplished, she had an idea for a new and unusual kind of packaging that would not only express the high quality of her preparations, but containers that would appeal to sophisticated women—boxes, jars, compacts, that would express and typify contemporary thought and living. Career women, college girls, debutantes and matrons had developed new standards of taste and it was her idea to create a family of personality packages entirely in accord with this mood.

Raymond Loewy who has designed nearly everything from lipsticks to locomotives, was asked to work out a packaging plan.

"These modern women are seeking products that express their new personality," Miss Cochran confided to Mr. Loewy, "and I feel there is an important market ready and waiting for the organization that meets these specialized demands."

Miss Cochran verbally sketched what she had in mind and according to Mr. Loewy the problem developed along these lines: Design a family of packages that are:

Simple in form
Light in weight and feeling
Easy to pack and ship
Expressive of the personality of the "new woman"
Typical of the modern living needs of contemporary-minded women
Symbolic of the spirit and significance of aviation
In tones and colors that will harmonize with current decorative trends
Aesthetically appealing
Expensive in appearance, but well within the bounds of a definite budget
So attractive they will sell.

Loewy likes to tackle problems of this sort and a glance at the beautifully proportioned and graceful forms of the new Jacqueline Cochran line, indicates how well he was able to carry them out. Not only are they characteristic of his work in the industrial design field, but they indicate at the same time an interesting interpretation of new processes and materials.

First, Mr. Loewy has made use of plastics in a novel and original way by selecting a material that can be molded to achieve perfect right angles combining at the same time, clean, straight lines with smooth flowing curves. Truly a triumph of creative effort and molding technique. The cream jars, rouge containers, etc., are molded in four parts; the inner bowl, which actually holds the ingredients to be packed; the outer container which holds and protects the inner bowl, and is molded in two sections to be cemented together afterwards; and the cover. The inner bowl is molded of a special phenolic material which is non-hygro- (*Please turn to page 64*)

FOR RAPID ASSEMBLY

by HARM WHITE

Spring tension fastenings that slip quickly in place, hold tightly, yet may be removed at will

MANY METHODS ARE PROVIDED FOR FASTENING plastic parts together after molding and finishing operations have been completed but the subject of economical assembly confronts the designing engineer each time a plastic part is planned. If the part is small enough to be molded in one piece there is no problem but with the tendency to mold housings much larger than ever before, and the incidental costs of assembling them into complete units, improved methods of fastening have taken shape.

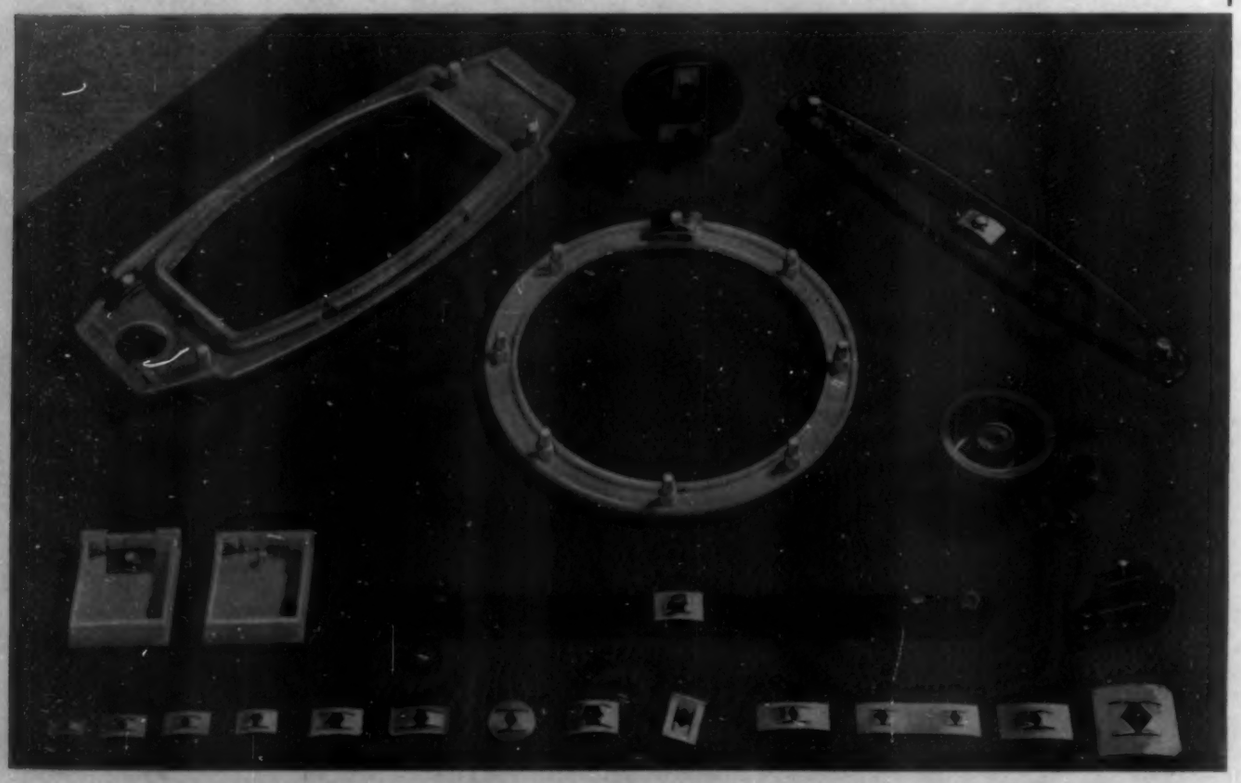
Threads, of course, can be molded into the part. But this slows up the molding operation because the parts must be "unscrewed" from the mold, or "jumped." Where any major degree of accuracy is required, the jumping process may injure the threads or distort them so the part will not fit. Then, too, it costs money to cut threads into the mold, and if the molding run is a long one, and a rapid schedule of production must be maintained, unscrewing the parts from the mold delays production to such an extent that extra cavities must be provided in the mold to offset the lost time.

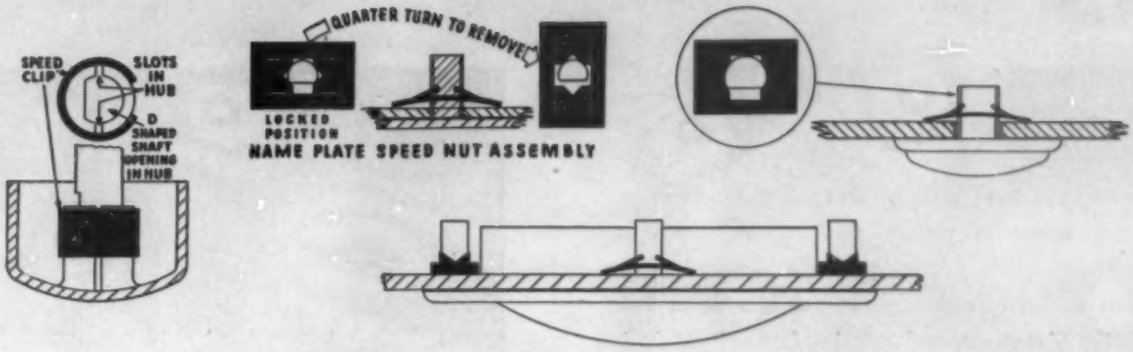
Even when threads are molded the process of assembly is comparatively slow because screws must be carefully started in order not to injure the threads if a tight fit is required. Drive screws, that require no threads are widely used and inserts with threads are often molded in.

More rapid than any of these is the patented Speed Nut system of assembly developed by the Speed Nut Division of the Tinnerman Stove & Range Co. for fastening handles on gas and electric ranges where lock washers and common nuts failed to do a good job. These nuts are made of spring steel, stainless steel and phospher bronze and are manufactured in scores of different shapes and sizes to meet all types of assembly requirements.

Their utility has long since reached beyond the stove industry and they are used on automobile assembly lines, in the refrigerator and radio industries, and more recently they have been found to speed up production and cut assembly costs in the manufacture of plastic parts. Since no threads are necessary, an integrally molded stud at the assembly points adds little to the cost of the part, causes no delay in the molding operation, and provides a

1





2

positive and permanent grip for the spring tension nut which simply "zips" on and stays put. It holds with a firm spring grip because it "bites" into the plastic stud or other molded part.

One of the distinctive operating features of this type of fastening is that it grips more tightly as the strain, twist or pull becomes more severe. In other words, it has a potential energy in reserve that is used when required at any time the assembled parts are subjected to severe vibration, twists or strains.

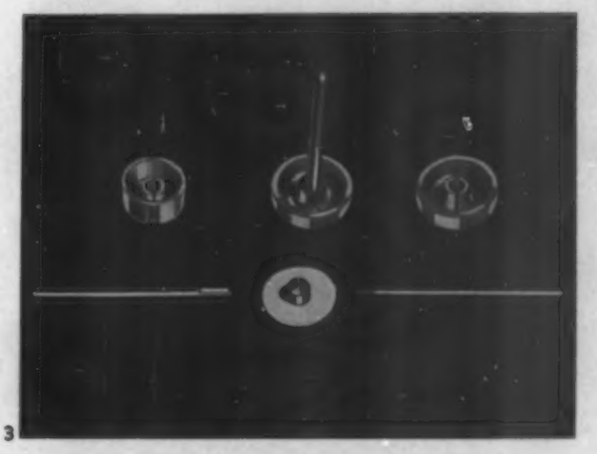
These nuts are also lighter in weight than other fastening devices, giving them an advantage in handling within the factory and a shipping advantage in the finished product. In the manufacture of radio cabinets, automobile instrument panels, dials and knobs, they may be used in corners and other inaccessible places where almost any kind of fastening tool is difficult to use.

When used over integrally molded studs, one particular type may be applied to a round stud for permanent fastening without removal, while another type may be used over a D-shaped stud for those plastic assemblies requiring dismantling for service. The nut designed for the D-shaped stud may be removed quickly by a quarter turn; and it is replaced as quickly after service work has been completed.

A brief study of the accompanying illustrations will indicate the variety of uses to which these rapid fastening devices may be applied, the diversity of sizes and shapes available, and the engineering thought and planning behind their creation.

In Fig. 1, for example, there are radio bezels, panels, an ornamental box, knobs and trim strips showing the molded studs and various designs of speed nuts used to hold them in position on the completed assembly.

Fig. 2 is a diagrammatic drawing with cross-section views illustrating the application of these fastening devices to the D-shaped integrally molded studs of a radio dial bezel and plastic knobs. The upper left portion of the illustration shows the position of the nut when applied; also when given a quarter turn for removal. Its arched position assures a firm and constant spring tension grip. At the extreme left of the same illustration, a speed clip is shown in both vertical and horizontal views to indicate its application to molded knobs. By using this clip, threads are eliminated, no welding is required around the hub, (*Please turn to page 60*)



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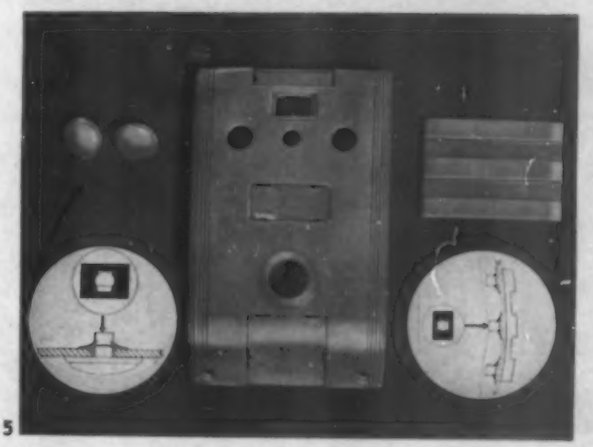


5

SOAP GRINDER:

Soap . . . powdered in an instant . . . merely by turning the crank on this molded Plaskon* dispenser—that's the feature that Voorhis-Tiebout Company offers to public and industrial wash rooms.

It works like this: you put a cake of special V-T soap in the dispenser, and a spring forces it against a set of revolving metal teeth. Fussing with bulky powdered soap is eliminated.

White Plaskon is used to achieve that clean, sanitary look, to make it harmonize with any color scheme. Plaskon also eliminates corrosion, takes the hard knocks that public washroom appliances often get, and cannot chip, peel or stain.

Molded by General Electric Co.

PLASKON*

ROLLING TABLEWARE:

Because they don't rust or tarnish . . . because they're non-fragile . . . because they're light as a feather and completely inert . . . and because they're gay and colorful—Plaskon moldings are ideal for tableware. That's why they're so widely used in the Sani-trete line shown at left.

Restaurants, hospitals, airplanes and railroad grille cars—such as the popular New Haven Grille Car shown below—are users of the Sani-trete tableware offered by Imperial Molded Products. The line includes many kinds of dispensers, toast-covers, creamers and butter dishes, all available in pleasing Plaskon colors—and all fadeproof, odorless and tasteless.

PLASKON
2121 SYLVAN AVE.
CANADIAN AGENT CANADIAN

PLASKON ON THE DESK:

Lusty offsprings of radio are inter-office communicating systems, and just as quick to recognize the value and advantages of plastics. Witness the Webster Company's Amplicall, a system with units housed in molded ivory Plaskon cases to harmonize with modern offices, especially the lighter, more modern type of office interior.

Molded by Richardson Company, the Amplicall housing takes advantage of the sculptural possibilities of molded-in grille-bars, microphone screen and decorative touches. The entire case is molded in two pieces, eliminating many assembly and finishing operations, while Plaskon's lustrous surface will not darken, dull or chip from sun, perspiration or hard knocks.

MOLDED COLOR

WEDDINGS BY TRAUB:

Wedding rings, it seems, are no different from other less romantic merchandise. Traub Manufacturing Company has proven that if rings are displayed on the counter in an attractive setting and boxed in an attractive container—sales of their rings improve.

So here's the way Traub does it—with Plaskon. A pleasing ivory Plaskon tray, richly engraved with the orange blossom motif and wiped-in with brown, displays a dozen rings against a plush lining. And an ivory Plaskon box with a similarly engraved and colored cover, encases the ring when it leaves the store. Competitive rings in ordinary packages just don't have a chance against this combination of rich-looking Plaskon container and display.

Rathbun Molding Corporation is the molder.

Trade Mark Reg. U. S. Pat. Off.*

COMPANY INCORPORATED
TOLEDO, OHIO
INDUSTRIES LTD. MONTREAL, P.Q.

THERMOPLASTIC PRINTING TYPE

by ALEXANDER BALL

Thermoplastic type is being made in Germany on much the same principle as type metal is cast

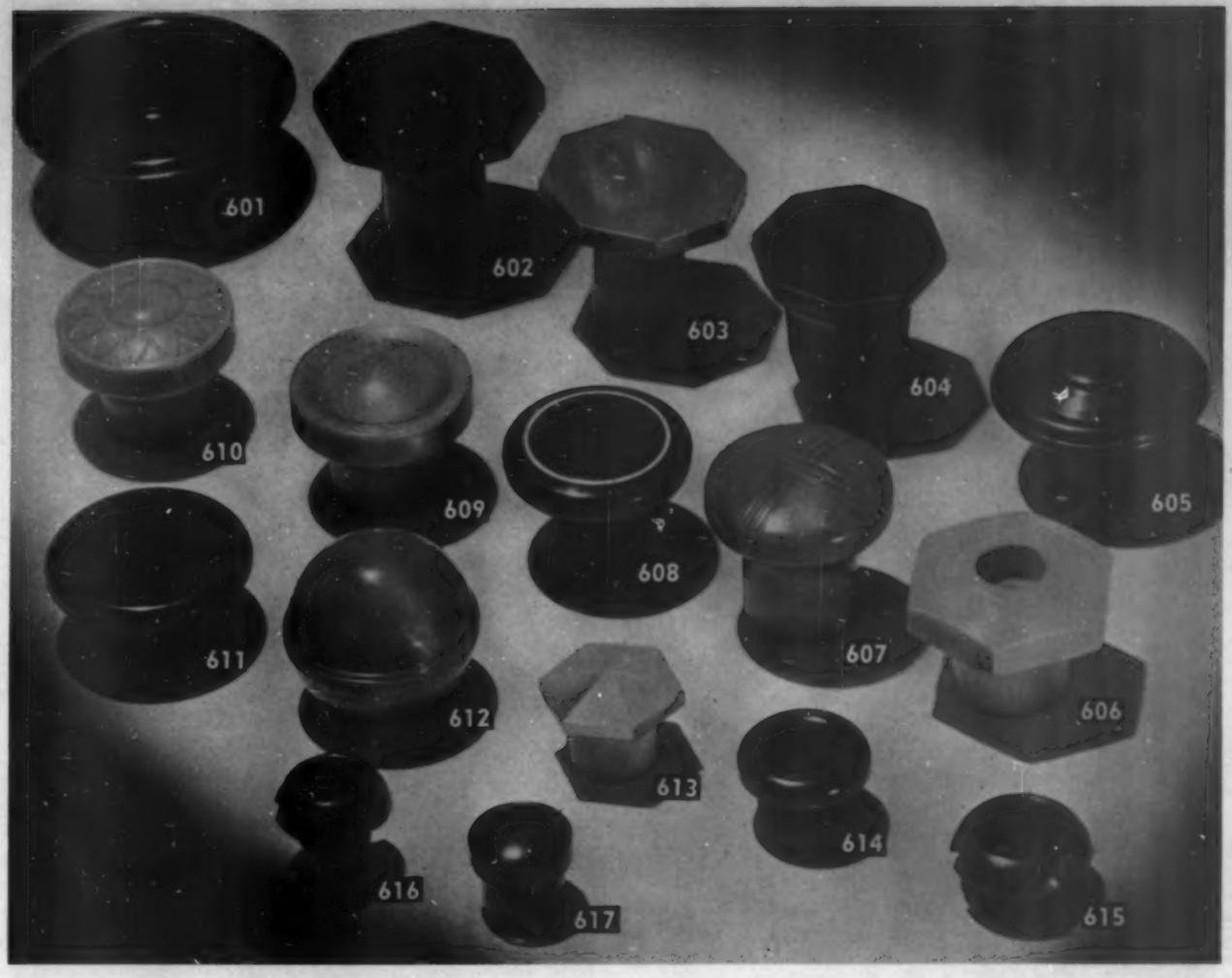
GERMAN TECHNICIANS ARE ENGINEERING THE first change in material for printing type since lead alloy was substituted for wooden type faces—and the new material is a thermoplastic capable of pressure casting in monotype or linotype machines. The new plastic type has been used commercially in Germany and is claimed to offer an advantage of greater elasticity and, made up in forms, about one-tenth the weight of lead alloy.

Development of plastic for type faces has been under way for several years, primarily by Dr. Bekk and Diplom-Ingenieur Ernst Strunk. It has been done under the German four-year plan for production of *ersatz* or substitute products to make Germany as nearly self-sufficient in raw materials as possible. Progress of the plan in all materials is published monthly in an official magazine, *Der Vierjahresplan*. Readers of the February number of the magazine, one of the best typographically in Germany, were amazed to find in its pages an announcement that four pages were printed from "kunstoffletter" (type of acetate plastic). The fact that *Der Vierjahresplan* has a circulation of more than 80,000 was indication that plastic type has durability as well as elasticity and lightness. The print used in this magazine was a normal 9-pt. Roman and no difference was discernible in a comparison of the plastic printed pages with the rest of the book.

Micro-photographs of single letters of plastic compared with lead alloy type after a run of 100,000 impressions have indicated practically as little wear as on ordinary metal type. (See Figs. 1–4 below.)

Details of the composition of the plastic used and cost of production of the type has not yet been made available. According to Engineer Ernst Strunk, however, the plastic material can be melted down and re-cast later, which he pointed out is one of the unique features of a thermoplastic. This "kun- (*Please turn to page 58*)

The type is cast, then set and distributed like common metal characters. It is also used in typesetting machines. The micro-photographs at the right show (Fig. 1) ordinary type-metal letter before and (Fig. 2) after 100,000 printing impressions. Fig. 3 is a thermoplastic letter before and (Fig. 4) after 100,000 impressions. Note, that because the thermoplastic type is more resilient than metal its edges remain sharper after use (Photos courtesy Deutscher Verlag)



STOCK MOLDS

SHEET FIFTY-SEVEN

Knobs and handles of different sizes and shapes are available in a wide variety of colors from stock molds. Please use company letterhead when writing for samples

---

601. Knob 1 3/4 in. diameter across top with stem 1/2 in. long. Round opening in stem for attachment 5/16 in. diameter

602. Octagonal knob with brass insert, 3/16 in. diameter. Knob is 1 1/4 in. high and about 1 1/2 in. diameter across top

603. Same as 602, 1 in. high and 1 1/4 in. diameter across top

604. Octagonal knob with metal attachment 3/16 in. long. 13/16 in. high, 1 in. diameter across top

605. Knob with metal insert and set screw. 1 1/4 in. diameter across top. 3/4 in. high

606. Hexagonal knob with opening 5/16 in. diameter at top which extends through to a 3/16 in. opening at base. 1 1/4 in. diameter across top. 11/16 in. high

607. Simply decorated knob, 1 1/16 in. diameter, 15/16 in. high

608. Knob with contrasting color wiped in a circular design. 13/16 in. high, 1 1/16 in. diameter

609. Knob 7/8 in. high, 1 1/16 in. diameter across top

610. Same as 609, with molded decoration

611. Knob 1 1/8 in. diameter, 1/2 in. high. Opening 3/16 in. diameter

612. Ball knob with metal threads. Opening 1/8 in. diameter. 3 1/4 in. in circumference

613. Hexagonal knob 1/2 in. high. 7/8 in. in diameter

614. 1/4 in. bushing

615. 3/8 in. bushing

616. 1/8 in. bushing

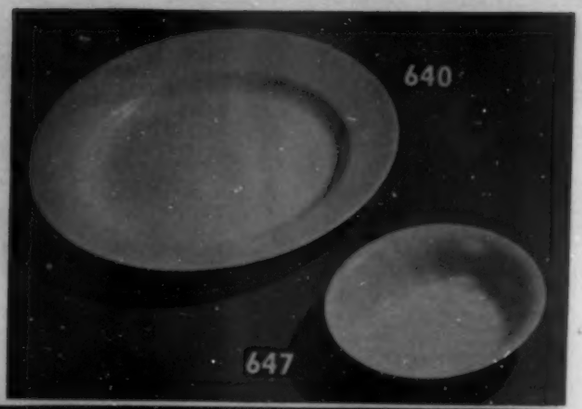
617. Knob 7/16 in. high, 9/16 in. diameter

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits

STOCK MOLDS

SHEET FIFTY-EIGHT

Molded urea tableware is available from stock molds. The dishes illustrated are light weight, easy to clean and ideally suited for aircraft, trailers, camps and such



640. Dinner plate. 8 5/8 in. in diameter

641. Vegetable dish 9 3/4 in. long, 6 7/8 in. wide and 1 5/8 in. deep

642. Bread or serving tray, 10 1/2 in. long, 7 1/8 in. wide and 1 1/8 in. high. The creamer is 3 1/2 in. diameter, and 2 1/2 in. high; while the covered sugar is 4 in. diameter and 2 1/4 in. high without cover

643. Drinking tumbler 2 3/4 in. diameter, 3 5/8 in. high

644. Bread and butter plate 5 3/4 in. diameter

645. Cup and saucer. Saucer is 3 3/4 in. diameter. Cup 3 5/8 in. diameter

646. Cereal or soup plate 6 1/4 in. diameter, 1 3/8 in. deep

647. Preserve dish, 4 7/8 in. diameter, 1 1/16 in. deep

648. Salt and pepper set with threaded tops. 3 5/8 in. high

649. Individual salt and pepper, 1 3/8 in. high

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits

THE PROPERTIES OF AN IDEAL PLASTIC*

by A. F. RANDOLPH[1]

WHAT INDUSTRY CALLS "THE PLASTICS" EMbraces materials of numerous types, and the number is increasing from year to year. No single one possesses all the properties which are recognized as desirable in a plastic just as no single metal or alloy has all the desirable properties of metals. It is the purpose of this paper to indicate what might be the properties of an hypothetical ideal plastic, a material of universal applicability to plastics uses, and to point out some of the merits and deficiencies of existing individual plastics, which determine their respective limited fields of usefulness.

First what are plastics and of what are they made? The following definition is proposed, with the realization that it is not strictly commensurate with the group to be defined. A plastic is a material which contains as its essential ingredient an organic binder and which, at some stage in its manufacture or in the fabrication of articles from it, is capable of being shaped by flow while in a plastic or liquid condition, and thereafter is capable of being brought to a more or less rigid condition.

Note that this definition would include some materials not usually included in the field of "the plastics," notably soft rubber and regenerated cellulose, and that in excluding inorganic materials like glass and portland cement it would exclude also cold-molded plastics of inorganic character. Note also that under conditions of service a plastic must not be plastic or soft; it must hold its shape at the temperature of use.

Plastics are ordinarily classified in terms of their respective base materials—cellulose acetate, phenol-formaldehyde, and so on. The number of base materials which have had some commercial exploitation is considerable (*1*).[2] The base material is the essential ingredient, and may be the sole ingredient. The base material, together with any modifying ingredient with which it is mutually soluble, such as a plasticizer, constitutes the binder portion of the plastic, the continuous structural mass to which the properties of the plastic as such are primarily due. The plastic may or may not contain other ingredients. Dyestuffs, usually soluble in one or another of the ingredients of the binder, color the binder without altering its structure. Pigments are coloring materials insoluble in the binder, and are dispersed therein as individual solid particles, but usually in quantities too small to alter appreciably the mechanical properties of the binder. Fillers, on the other hand, are finely ground solids added in larger proportions, not primarily for purposes of coloration, but to cheapen the compound, or to alter its properties, or both (*2*). Lubricants may be added in very minor proportions, to facilitate the removal of articles from molds.

Another convenient classification embracing most plastics is based on the behavior of the material in its final form toward heat, distinguishing between the thermoplastic, which may be repeatedly softened by heating and hardened by chilling, without undergoing permanent change in behavior, and, on the other hand, the thermosetting, which, while softened by the initial application of heat, is hardened by continued heating and is thereafter no longer capable of being appreciably softened by heat.

It is customary also to divide the plastics into groups in accordance with the methods used in fabricating articles from them, namely, (a) molding compounds, the separate particles of which can be welded together by heat and pressure to form a continuous mass which takes the shape of the mold cavity, (b) die-pressing compounds, of which discrete particles cannot be welded together in this manner, but which in the form of continuous blanks can be shaped by heat and pressure, and (c) the "turnery" plastics, from which articles are fabricated by machining operations, rather than by shaping by heat and pressure. Some plastics appear in only one of these groups, others in more than one.

At the start of a discussion of the properties desired in plastics—those properties of which a complete combination would characterize the ideal plastic—it must be recognized that a low cost is probably the most important item of all. And since the plastics are ultimately sold by the piece, the cost per volume is more important than the cost per pound.

Specific gravity, then, should be low; at a given cost per pound, the cost per article is correspondingly lower. And of course lightness in weight is one of the important advantages of the plastics as a class. (*Please turn to page 66*)

* Paper presented as part of a symposium on plastics at the Rochester meeting of the American Society for Testing Materials on March 9, 1938.

[1] Plastics Dept., E. I. du Pont de Nemours and Co., Inc.

[2] The underlined numbers in parentheses refer to the reports and papers appearing in the list of references appended to this paper.

PERMANENCE OF PLASTICS*

by GORDON M. KLINE
National Bureau of Standards

This article, installments of which appeared in April and May, concludes with this issue

3. Water

The absorption of water by plastics either at high relative humidities or upon immersion is undesirable for many applications because of its adverse effect upon electrical properties and upon dimensional stability. Although most synthetic resins take up only 0.1 to 0.2 percent of water the great bulk of commercial molding compositions have fibrous fillers, such as woodflour, paper and woven fabric, which have a pronounced affinity for moisture and are only partially protected by the resinous binder. On the other hand, some plastics become relatively brittle if their normal moisture content is removed by storage in a warm dry place. This is particularly true of cellulose and protein plastics. It is readily apparent, therefore, that the moisture content of plastics is an important factor not only with respect to their durability, but also with relation to the establishment of a standard conditioning environment for test specimens.

In weathering tests the samples are subjected to variations in moisture content as well as to temperature changes and ultraviolet light. It has been observed in the course of our exposure tests with transparent plastics that some specimens become opaque on rainy days and regain their transparency when the weather clears. The few specimens that behaved in this manner were also observed to have poor stability to sunlight. Tests made under carbon-arc light both with and without water spray also indicate that some plastics deteriorate more rapidly in the presence of water. The Bell Telephone Laboratories have employed a humidity-temperature cycle in testing synthetic resin finishes which may be of value in studying plastics. The cycle[3] consists of 3 days at 95 °F and 90 percent relative humidity, 1 day at 125 °F and 15 percent relative humidity, and 3 days at 75 °F and 50 percent relative humidity, which is repeated for as many weeks as desired.

The amount of water absorbed by laminated plastics has been used as a method of grading these materials by the National Electrical Manufacturers Association in this country. Table 5 (see opposite page) lists their standard specifications for water absorption, mechanical strength and electrical properties of these materials as determined by A.S.T.M. methods.

In determining the amount of water absorbed, the area of cut edges exposed, the ratio of total surface area to the size of the specimen, and the length of time of immersion are important factors. It is unfortunate that the methods in use in various countries differ quite markedly in regard to these details. The German, British and A.S.T.M. methods are summarized in Table 6.

The advisability of fixing definite humidity and temperature conditions for the testing of plastics is apparent from the above discussion of the effects of variation in

* Paper presented as part of a symposium on plastics at the Rochester meeting of the American Society for Testing Materials on March 9, 1938. Publication approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

[3] A. E. Schuh and H. C. Theurer, "Physical Evaluation of Finishes," Ind. Eng. Chem., Analytical Ed. 6, 91–7 (Mar. 15, 1934).

TABLE 6.—STANDARD METHODS FOR DETERMINING WATER ABSORPTION

Country	Method	Size of specimen	Preliminary conditioning	Time of immersion in water	Temperature of test
England	E.R.A. Ref. B/S3 for molding and sheet materials	50 mm. diameter; 10 mm. thick	50°C to constant weight	24 hours	Room temperature
Germany	V.D.E. 0324 for Hartpapierplatten (no method for molded materials)	120 × 15 mm.; thickness as received	None	96 hours	15 to 25°C
United States	A.S.T.M. D 48-33 for molded insulating materials	101.6 mm. (4 in.) diameter; 3.18 mm. (1/8 in.) thick for hot-molded materials; 6.35 mm. (1/4 in.) thick for cold-molded materials	For materials which soften readily: 24 hours in a desiccator or at 50°C ± 5° in an oven For materials which do not soften readily: 24 hrs. in an oven at 100°C ± 5°	48 hours	25°C ± 2°
United States	A.S.T.M. D 229-37T for sheet and plate materials	76.2 × 25.4 mm (3 × 1 in.); thickness as received	1 hour at a temperature of from 105 to 110°C	2 hours, 24 hours, and saturation	25°C ± 2° for 2 and 24 hr. tests and 20° to 30° for saturation test

these factors on their properties. In this respect plastics are similar to other organic materials, such as paper, leather and textiles, for which arbitrary values have been fixed for normalizing the specimen in order to eliminate the effect of daily variations in atmospheric conditions. Furthermore, fixing upon a definite environment in which to condition and, except in special cases that require unusual treatment, to test specimens for strength, hardness, optical, thermal and electrical properties should make the correlation of such data more reliable and will simplify the problem of setting up laboratory facilities for testing plastics.

The British and German standardizing bodies have already recognized the advantages and necessity of establishing such a conditioning environment. The British Standard Specification for Moulded Insulating Materials requires that the specimen shall be subjected to a controlled atmosphere of 75 percent relative humidity at a temperature of 20°C. (tolerance ±5°) for not less than 18 hours immediately prior to the start of the test. The British Electrical Research Association in a recent report[9] has listed a variety of conditioning environments for use in testing plastics, depending upon the service conditions to which (*Please turn to page 62*)

[9] "Directions for the Study of Hard Composite Dielectrics (Mouldings, Sheet, and the Like)," J. Inst. Elec. Eng. *81*, 553–64 (Oct. 1937).

TABLE 7.—CONDITIONING ENVIRONMENT RECOMMENDED BY THE BRITISH ELECTRICAL RESEARCH ASSOCIATION FOR USE PREVIOUS TO THE DETERMINATION OF THE ELECTRIC STRENGTH OF INSULATING MATERIALS

Condition	Temperature °C	Time hours	Humidity (relative) percent	Means of humidity control
Normal	15–25	18–24	75	Wet salt (NaCl) crystals
Very dry	120–130	18–24	[a]	..
Dry	75–80	18–24	[a]	..
Damp	15–25	18–24	Approximately 95	Water only
Tropical	45–50 day and 15–25 night	during the (8 hours) during the (16 hours)	Approximately 90 during the day Saturated[b] during night	Water only
Chemically treated[c]	15–25	168 (1 week)	..	..

[a] Air at ordinary temperature and humidity is to be heated to the temperature specified, without any artificial drying or humidifying.

[b] The cubic capacity of the conditioning chamber compared with its internal area and the total area of the specimens must be such that a liberal condensation of moisture occurs on the latter during the low-temperature period.

[c] The treatment to be given will depend on the purpose for which the material is required, the following being employed:

(i)	If exposed to rain or water.....	Distilled water
(ii)	If exposed to sea water.....	10 percent solution of salt in distilled water
(iii)	If exposed to acid.....	Sulphuric acid, specific gravity 1.25 at 15°C
(iv)	If exposed to alkalies.....	10 percent solution of caustic soda
(v)	If exposed to ozone.....	Treatment to be given is under consideration
(vi)	If exposed to ultraviolet light...	
(vii)	If exposed outdoors.....	

TABLE 5.—STANDARD SPECIFICATIONS OF THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (N.E.M.A.) FOR PHENOLIC LAMINATED PRODUCTS, BASED ON A.S.T.M. TEST METHODS. (SEE N.E.M.A. PUBLICATION NO. 34-36, JUNE 1934)

N.E.M.A. designation	Base material	Water absorption at 25°C ± 2° in 24 hrs.		Compressive strength (flatwise)		Flexural strength		Tensile strength		Dielectric strength at 23°C				Dielectric constant at 10^6 cycles and 21°C		Power factor at 10^6 cycles and 21°C		Dielectric loss factor (power factor × dielectric constant	
										Short time		Step by step							
		Maximum	Average	Minimum	Average	Minimum	Average	Minimum	Average	Minimum	Average	Minimum	Average	Maximum	Average	Maximum	Average	Maximum	Average
		percent	percent	lb./in.[2]	lb./in.[2]	lb./in.[2]	lb./in.[2]	lb./in.[2]	lb./in.[2]	v./mil.	v./mil.	v./mil.	v./mil.	v./mil.	v./mil.				
X	Paper	6.0	4.0	.....	.....	16,000	21,000	9,000	12,500	500	700	300	500	...	...	...	...	..	..
P	Do	2.0	1.3	.....	.....	11,000	15,000	6,000	8,000	500	600	300	400	...	...	...	...	..	..
XX	Do	2.0	1.3	.....	.....	12,000	16,000	6,000	8,000	500	700	300	500	6.0	5.5	0.055	0.045	0.33	0.25
XXX	Do	1.2	1.0	.....	.....	12,000	15,000	5,000	7,000	500	650	300	450	5.5	5.0	0.040	0.035	0.22	0.18
C	Fabric (>6 oz./yd.[2])	2.5	1.7	35,000	38,000	16,000	20,000	7,500	10,000	...	150	650	100	5.5	5.0	0.040	0.035	0.22	0.16
CE	Do	1.75[a]	1.5[a]	34,000	36,000	16,000	19,000	7,500	9,500	300[b]	425[b]	200[b]	275[b]	6.0	5.5	0.065	0.055	0.40	0.30
L	Fabric (<6 oz./yd.[2])	2.5	2.0	30,000	35,000	13,000	20,000	7,000	9,500	...	150	...	100	...	7.0	...	0.10	..	0.70
LE	Do	1.8	1.2	33,000	37,000	15,000	19,000	6,500	9,000	400	500	240	300	5.5	5.0	0.055	0.045	0.30	0.22

[a] These values are for material 1/16 in. thick; for material 1/8 in. thick the values specified are 1.5 for the maximum standard and 1.25 for the approximate average.

[b] These values are for material 1/16 in. thick; for material 1/8 in. thick the values specified for the short time test are 250 for the minimum standard and 350 for the approximate average; corresponding values for the step by step test with 1/8 in. thick material are 150 and 200, respectively.

PLASTICS DIGEST

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them

General

IMITATION OF NATURAL MATERIALS IN PLASTICS. E. Lyonnais. Rev. Gén. Mat. Plastiques *14*, 54–7s (Mar. 1938). Reproduction of rare minerals (opal, onyx, topaz, sapphire, etc.), rare woods and animal products (bone, ivory, pearl, etc.) in various materials, chiefly plastics, is discussed. In many instances means of distinguishing the natural products from the artificial ones are outlined. (Not complete in this issue.)

RESINOUS PRODUCTS FROM MOLASSES. Chem. Age (London) *38*, 283 (Apr. 9, 1938). The Imperial Institute of Sugar Technology at Cawnpore, India, has developed a process of resinifying molasses with a mixture of coal tar and asphalt in the presence of acids, wherein the carbohydrates in the former combine with the phenolic bodies in the latter to form a resin insoluble in water. The product is proposed for use as a road-surfacing material.

SCOPE AND POSSIBILITIES OF PLASTIC MATERIALS. G. Dring. Automobile Engineer (London) *28*, 95–6, 114 (Mar. and Apr. 1938). A review.

WHAT COLORS SHALL WE USE? A. G. Corfield. Plastics (London) *2*, 120–1 (Apr. 1938). The popularity rating of various colors for industrial products, building decoration and vehicles in England is as follows: whites 28.1, black 17.2, greys 11.4, greens 9.5, stones 9.5, reds 8.7, browns 6.3, blues 5.3, yellows 3.6 and silver 0.3%. White is most popular with every trade except automobiles, wherein black leads with second place shared with greys, reds and blues.

Materials and manufacture

PRESENT STATUS OF CELLULOSE NITRATE PLASTICS. J. Bader. Rev. Gén. Mat. Plastiques 14, 63–8 (Mar. 1938). A comparison of the properties of cellulose nitrate, cellulose acetate and casein, and a discussion of the economic situation of pyroxylin in France.

PREPARATION OF VULCANIZED FIBRE. E. Becker. Kunststoffe *28*, 83–5 (Apr. 1938).

ALICYCLIC COMPOUNDS IN PLASTICS. British Plastics *9*, 607–8 (Apr. 1938). Uses of hydrogenated derivatives of phenols, such as cylohexanol, cyclohexanone, etc., as solvents, plasticizers and resin-forming substances are discussed.

Molding and fabricating

MOLD CONSTRUCTION. R. Sprenger. Kunststoffe *28*, 81–3 (Apr. 1938). The use of box construction with a lining of alloy steel over ordinary steel in order to diminish alloy steel requirements is described.

INJECTION MOLDING. R. Bluma and J. Delorme. Rev. Gén. Mat. Plastiques *14*, 626s–(Mar. 1938). Thermoplastics available for molding by injection are cellulose acetate, benzylcellulose, ethylcellulose, and styrene, vinyl and acrylic resins. Their properties are compared and possible applications listed. Injection molding technique is to be considered in a later issue.

POLISHING OF PLASTICS. J. Bel. Rev. Gén. Mat. Plastiques *14*, 58–9s (Mar. 1938). Various wet and dry methods of polishing plastics are reviewed.

LATEX MOLDS FOR CASTING PURPOSES. E. T. Hall. India Rubber World *97*, 35–7 (Mar. 1938).

Applications

PLASTICS IN LIGHTING. F. W. Warner, Jr. Trans. Illum. Eng. Soc. *33*, 244–61 (Mar. 1938). The author summarized the more important characteristics of plastics relative to their use in lighting. 1. Light weight: permits savings in structural details, lowers center of gravity in lamps, decreases shipping expenses, provides greater safety for overhead fixtures. 2. Strength: tougher and more flexible than glass, will not shatter, will not crack from sudden temperature changes. 3. Form: available in multiplicity of forms, intricate designs are possible, dimensions can be held accurately, large sizes are practical. 4. Color: infinite range at little or no cost increase, transparent to opaque, plain or mottled. 5. Optical: comparable to glass, variable to suit requirements as to transmission, reflection and diffusion, accurately maintained. Temperature limitation is approximately 75 degrees Centigrade.

MODERN HEATING SYSTEMS. Plastics (London) *2*, 115–16 (Apr. 1938). Electric heaters are inclosed in molded housings.

SERVICEABILITY OF GLUE JOINTS. D. Brouse. Mech. Eng. *60*, 306–8 (Apr. 1938). Destructive relative humidities appear to be between 60% and 80% for animal and vegetable or starch glues, between 80% and 90% for casein glue and between 90% and 97% for blood glue. Joints made with hot-pressed synthetic resins are highly resistant to conditions favoring mold attack and retain a high percentage of their dry strength when saturated with water or exposed to high humidities.

ROLLING STEEL ON COMPOSITION BEARINGS. O. K. Graef. Iron Age *141*, 50–5 + (Mar. 17, 1938). All types of rolling mills except the hot sheet mill (temperature too high) have been satisfactorily equipped with phenolic composition bearings. One set has operated continuously for 18 months on a six day (24 hrs. per day) basis with never less than a load of 10,000 lb. per sq. in. of projected bearing area, wearing down only $1/16''$ during the first year. They require about 7 gal. per min. of water for cooling and lubrication. Overall saving in power for a year was $22\frac{1}{2}$ percent.

LUMBER ADVANCES: NEW METHOD OF MAKING PLYWOOD USING SYNTHETIC RESIN ADHESIVE. Mech. Eng. *60*, 338 (Apr. 1938). The logs are fed into a new style, high-speed peeling lathe from which ribbon veneer emerges to be dried, impregnated with phenolic resin and pressed into finished lumber. These boards meet predetermined specifications, with widths previously unavailable and with a uniform adherence to specification comparable to that of the steel construction industry. (From Industrial Bulletin, A. D. Little, Inc.)

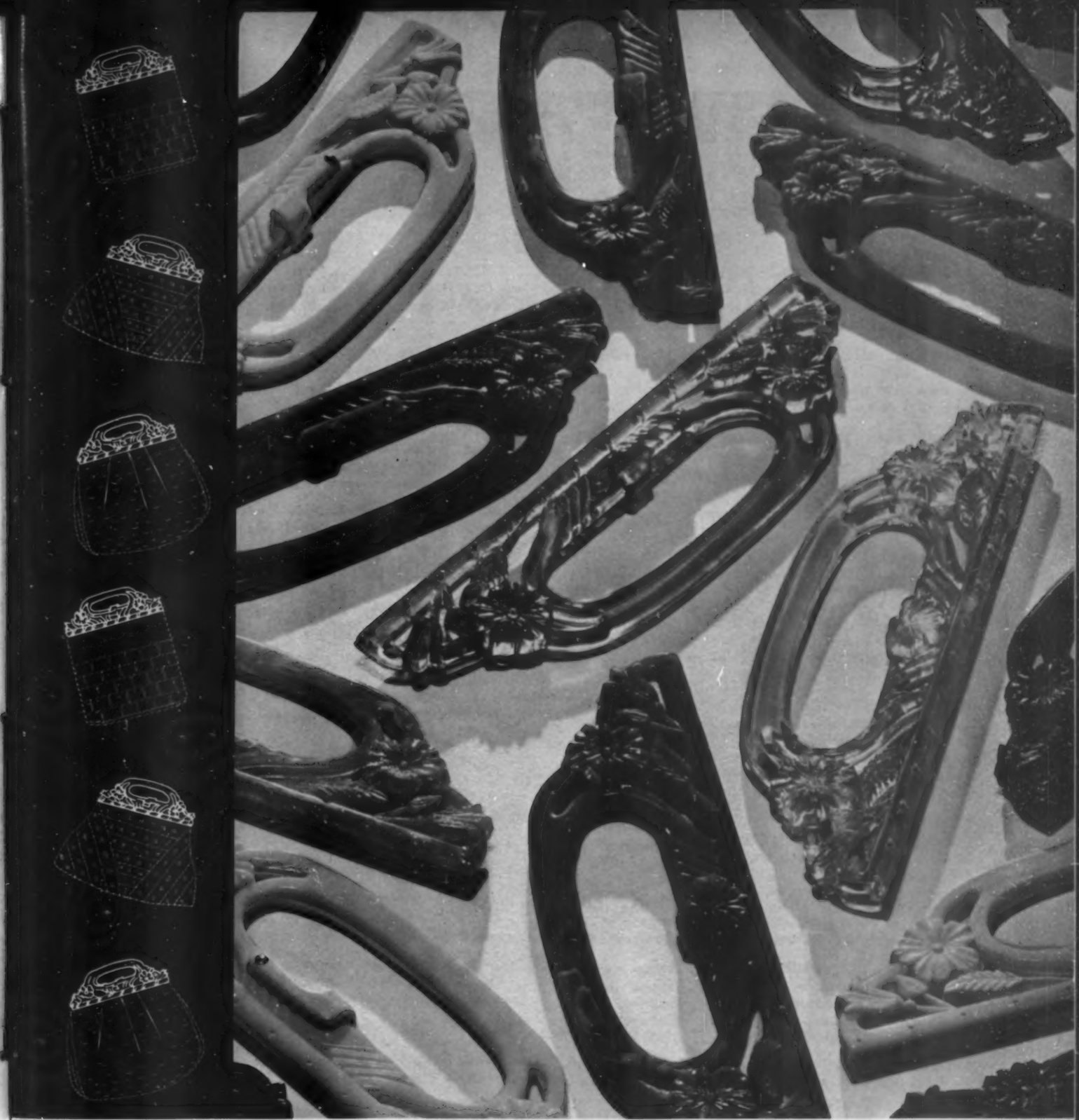
BRADSHAW SCREW. Plastics (London) *2*, 131 (Apr. 1938). A thief-proof screw having a cup shaped head requiring a special screw driver to insert and remove it, has been developed to reduce the loss of small fittings in public buildings and vehicles. A small domed cap molded of cellulose acetate which can be made to match any scheme of decoration is driven into the head of the screw.

Test methods and results

TRACKING OF PLASTICS. Karl Nerz. Kunststoffe *28*, 85–8 (Apr. 1938). Data on electrical properties of plastics, chiefly resistivity, tracking and arcing, are presented.

TRANSLUCENT PLASTIC LAMINATED SHEET. British Plastics *9*, 588, 591 (Apr. 1938). Data on the loss in weight on heating at 110° C., gain in weight on immersion in water at 20° C. and dimensional changes when exposed under the above conditions for 1, 7 and 21 days are given for laminated phenolic plastic. The percentage change in length and breadth was less than 1% in every instance.

TESTING AND APPLYING PAINT. F. Fancutt. Chem. Age. *38*, 299–301 (Apr. 16, 1938). A discussion of the role of pigments, oils and resins in modern finishes and of various methods of preparing metal surfaces for application of the protective coating.



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Lower production costs . . . added beauty and serviceability of the product . . . are proved advantages of Tenite in a great variety of uses. Tenite is a tough, practically unbreakable plastic made of Eastman cellulose acetate. Write today for a 52-page book on Tenite and its industrial and decorative applications.

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TENNESSEE EASTMAN CORPORATION (Subsidiary of the Eastman Kodak Co.) **KINGSPORT, TENN.**

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

JOINING GLASS BLOCKS. Jas. F. Hyde (to Corning Glass Works). U. S. 2,112,241, March 29. Glass building blocks are joined together with an adhesive cement of polymerized vinyl acetate, both glass and resin being wetted with monomeric vinyl acetate before joining.

SHEET MATERIAL. H. D. Rice (to U. S. Rubber Products, Inc.). U. S. 2,112,544, March 29. Laminated material having a base, a coating of synthetic rubber-like polymer which is permeable to solvents but is not swelled by them, and an interlayer of rubber deposited from latex.

VARNISH RESIN. Jas. B. Bullitt, Jr., and D. E. Edgar (to E. I. du Pont de Nemours and Co.). U. S. 2,112,556, March 29. An alkyd resin, modified with a drying or semidrying oil, is blended with a urea-formaldehyde resin in solution.

PROTEIN PLASTICS. S. Morgenstern and J. Eggert (to Deutsche Hydrierwerke Aktiengesellschaft). U. S. 2,112,728, March 29. Plasticizing protein resin compositions with a cycloalkyl or long chain alkyl ester, amide, sulphone or sulphonamide derivative of an organic derivative of sulphuric or phosphoric acid.

INSULATION. H. C. Burmeister (to General Electric Co.). U. S. 2,112,732, March 29. Strong, pliable insulation is made by coating and partly impregnating a fibrous web with an arylamine-aldehyde resin which has a high dielectric constant.

DRAWING BOARDS. Chas. B. Chatfield. U. S. 2,112,762, March 29. Blackboards, or drawing boards in any color, are made by coating fiber board or cement-asbestos board with a resin such as Vinylite, pigmented with titanium dioxide, chrome green, carbon black or other pigment according to the color desired, and making crayon in contrasting color from a triethanolamine soap and a suitable pigment.

CELLULOSE MIXED ESTERS. C. R. Fordyce and John Emerson (to Eastman Kodak Co.). U. S. 2,113,300, April 5. Acylating cellulose with a mixture of acid anhydrides in which some but not all the acid radicals have a chain of at least 12 carbon atoms.

CELLULOSE MIXED ESTERS. H. S. Gardner, Jr. (to Eastman Kodak Co.). U. S. 2,113,301, April 5. Cellulose esters in which a major portion of the acid used for esterification is propionic or butyric.

CELLULOSE ACETATE-PROPIONATE. Carl J. Malm and C. L. FLETCHER (to Eastman Kodak Co.). U. S. 2,113,304 and 2,113,305, April 5. Making a low-viscosity cellulose acetate-propionate; and use of this ester, or cellulose acetate-butyrate, in toluene-alcohol solution to produce flexible transparent films.

LAMINATED FABRIC. H. Schuhmann (to General Electric Co.). U. S. 2,113,434, April 5. Roughening rayon fabric and bonding layers of the fabric together with a synthetic resin.

SURFACE FINISH. C. W. Hoffman, J. C. Schmidt and W. T. Flowers (to Pratt and Lambert, Inc.). U. S. 2,113,449, April 5. Obtaining multitone metallic effects by spraying with a thinned finish containing nitrocellulose, oleoresin or a resin, a pigment and a metal powder.

UREA RESIN. Ignaz Kreidl. U. S. 2,113,485, April 5. Sulfurized urea-aldehyde resins are made by alkaline condensation of urea with an aldehyde in presence of a polysulphide.

PRINTING ROLL. A. L. Freedlander and Jos. Rockoff (to Dayton Rubber Mfg. Co.). U. S. 2,113,724, April 12. An oilproof synthetic rubber-like material, not harmed by de-inking compositions, is used as the cover for veneer printing rolls.

OLEFIN RESINS. L. H. Fitch, Jr., and F. E. Frey (to Phillips Petroleum Co.). U S. 2,113,584, April 12. Catalyzing the olefin-sulphur dioxide resinification reaction with oxygen or an organic peroxide.

SAFETY GLASS. M. L. Macht (to E. I. du Pont de Nemours and Co.). U. S. 2,113,764, April 12. Plastic interlayers for safety glass are protected from damage during transit and handling; a thin film of material which is not self-adhesive is applied, and stripped off before using the interlayer.

SAFETY GLASS. Louis Paggi (to E. I. du Pont de Nemours and Co.). U. S. 2,113,767, April 12. Coating a plastic interlayer (for safety glass) with a film of the same plastic but with very little plasticizer. The film serves, at least in part, to bond the interlayer to glass.

FRICTION FACINGS. H. L. Bender (to Bakelite Corp.). U. S. 2,114,121, April 12. A binder for use in brake linings, clutch facings and the like is made by condensing an alkene-phenol with an aldehyde.

ABRASIVES. H. C. Martin and F. A. Upper (to Carborundum Co.). U. S. 2,114,229, April 12. Resin-coated abrasive grains are heated without melting the resin, to ripen and strengthen the bonding agent.

POLYMER. H. T. Neher and C. S. Hollander (to Röhm and Haas Co.). U. S. 2,114,233, April 12. An interpolymer of ethyl methacrylate and methyl acrylate.

PAINTS. Paul Koch (to J. R. Geigy A.-G.). U. S. 2,114,251, April 12. A chlorinated rubber paint in an organic solvent is pigmented with sulphur.

PRINTING PLATE. Arthur B. Davis. U. S. 2,114,288, April 19. Molding a printing plate face by applying a synthetic resin to the original type form with the aid of a metal carrier sheet, and stripping off the molded plate from the type form.

VINYL POLYMER. F. E. Frey, L. H. Fitch, Jr., and R. D. Snow (to Phillips Petroleum Co.). U. S. 2,114,292, April 19. Polymerizing vinyl chloride or allyl chloride in presence of sulphur dioxide.

CELLULOSIC PLASTIC. L. C. Gustin and R. F. Hoflin. U. S. 2,114,300, April 19. Making a plastic from an inert porous filler and a binder comprising an adhesive gum and a cellulose derivative solution.

COATED FABRIC. Geo. Schneider (to Celanese Corp. of America). U. S. 2,114,320, April 19. Waterproofing textiles by joining them, under heat and pressure, to a cellulose derivative film or foil.

COATINGS. Fred H. Lane (to Hercules Powder Co.). U. S. 2,114,391, 2,114,392 and 2,114,393, April 19. A gasolineproof varnish contains a resin from pine wood extract; the resin may be plasticized with a fatty oil; or it may be esterified and used for greaseproofing paper.

WOOD FINISH. W. O. Maisch (to the Firm of Hermann Frenkel). U. S. 2,114,784, April 19. Coating wood with a resistant varnish containing a solution of a hardenable phenol-formaldehyde resin.

PETROLEUM RESIN. Everett H. Crawley, U. S. 2,114,796, April 19. Obtaining a resin from residue left after dewaxing petroleum oils.

VARNISH RESIN. Ralph W. Hall (to General Electric Co.). U. S. 2,114,877, April 19. A hard, tough resin which is resistant to abrasion and to moisture is made from a hydrolyzed polyvinyl ester, an aldehyde and furfural.

SEALING COMPOSITION. E. B. Schuler (to Glidden Co.). U. S. 2,114,985, April 19. A sealing and coating composition contains casein, plasticized with a glycerol-boric acid resin.

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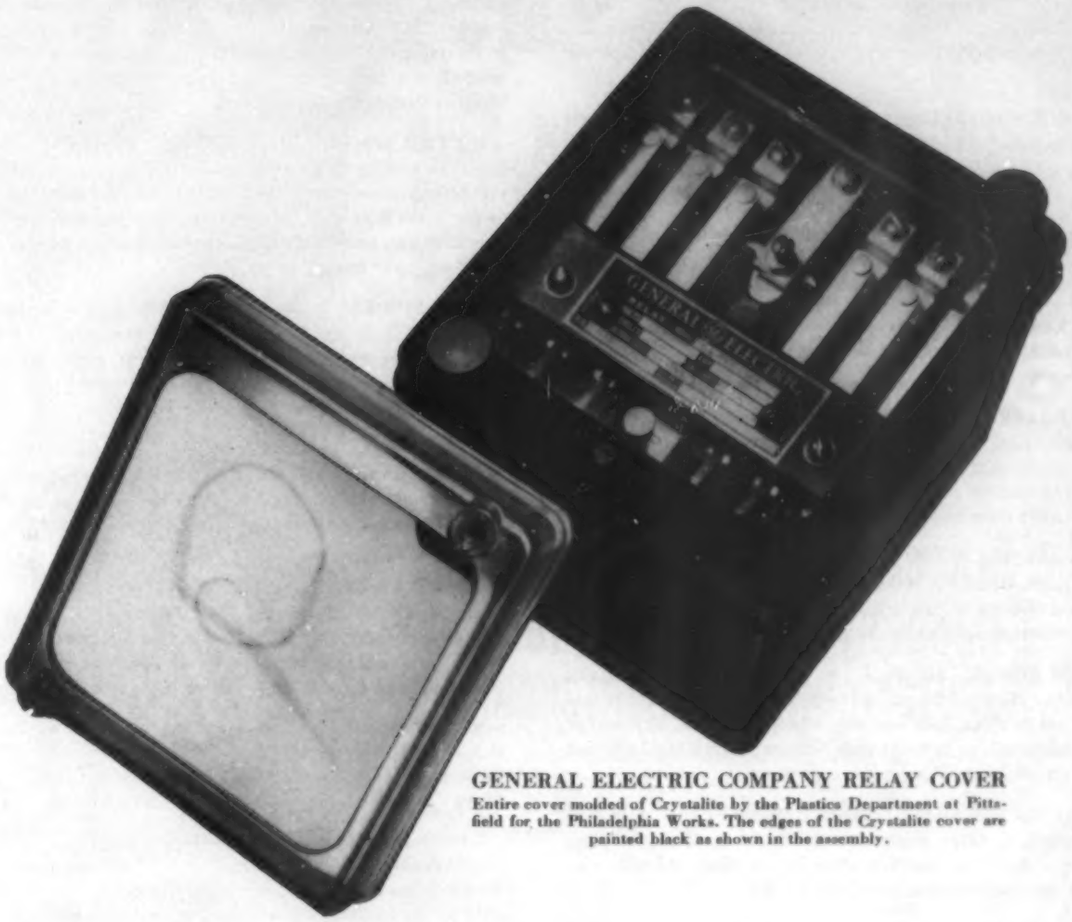
ACRYLIC RESIN

MOLDING POWDER



GENERAL ELECTRIC COMPANY RELAY COVER
Entire cover molded of Crystalite by the Plastics Department at Pittsfield for the Philadelphia Works. The edges of the Crystalite cover are painted black as shown in the assembly.

Crystalite for compression molding is supplied in three degrees of plasticity, hard, medium and soft, to cover a wide range of molding requirements and flow conditions.

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FOREIGN PLASTICS PATENTS

Application dates are given for patents of European countries, but for Canada the issue date is given

ACRYLATE RESINS. Röhm und Haas Aktiengesellschaft. German P. 655,570, Jan. 24, 1928. Polymerizing acrylic acid or its derivatives in presence of substances which liberate free oxygen, and accelerating the polymerization by applying heat or pressure or both.

SHRINK CAPS. Kalle & Co. German P. 655,737, Dec. 12, 1932. Highly polymerized thermoplastic vinyl resins are used, with or without plasticizers and pigments or fillers, in making shrink caps for bottles.

COLD MOLDING RESINS. Richard Hessen (to Aug. Nowack Aktiengesellschaft). German P. 655,695, April 19, 1930. Resols are adapted for cold molding by adding at least 60% of m-cresol or 1,3,5-xylenol.

PLASTICIZERS. B. C. Bren (to Canadian Industries, Ltd.). Can. P. 372,120, March 1. Use of N-dimethoxyethyl-p-toluenesulphonamide and its homologs as plasticizers for cellulose acetate.

SUGAR RESIN. Geo. W. Seymour (to Camille Dreyfus). Can. P. 372,138, March 1. Making acetone-soluble resins from sugar by acid polymerization.

WOOD FILLER. H. Strauch (to I. G. Farbenindustrie Aktiengesellschaft). Can. P. 372,167, March 1. A mixed filler containing woodflour, chalk, talc, stone meal and chromium oxide is wetted with an aqueous dispersion containing an alkyd resin (modified with a drying oil) and a reaction product of castor oil and ethylene oxide.

RESIN CASTING. G. M. Kuettel (to Canadian Industries, Ltd.). Can. P. 372,299, March 8. Making flawless, bubble-free massive polymethacrylate castings by polymerizing the ester below the temperature of bubble formation, and heating at 95–115° C. for about 24 hours.

VARNISH RESINS. Bakelite G. m. b. H. Austrian P. 151,491, Feb. 8, 1930. Hardenable phenol-formaldehyde resins are combined with tung oil in solution in acetone, isopropyl alcohol, terpineol or methylcyclohexanol, to make varnish resins with very high adhesion and elasticity, or (with fillers) molding powders.

INSULATING VARNISH. Deutsche Celluloid-Fabrik. French P. 816,924, March 8, 1937. High grade resins for insulating or cable varnishes are made by interpolymerization of vinyl chloride with acrylic or maleic acid or their esters, nitriles or amides.

UREA PLASTICS. Marie B. Rousset and A. V. Keller (to Brush & General Mouldings Mfg. Co., Ltd.). British P. 475,686, Sept. 9, 1936. Resins which are suitable for molding compositions are made by condensing urea with formaldehyde in presence of a sugar such as sucrose or dextrose.

ALKYD RESIN ENAMEL. Chas. S. Farmer. British P. 470,471 and 470,472, Feb. 13, 1936. Drying oil modified alkyd resins which yield high grade varnishes or enamels are made by condensing the drying oil first with a polybasic (phthalic or maleic) acid or anhydride, and then with a polyhydric alcohol such as glycerol.

BASE EXCHANGE RESINS. Eric L. Holmes. British P. 474,361, Feb. 24, 1936. Resins which are characterized by their ability to undergo base exchange reactions, e.g., in water softening, are made by condensing polyhydric phenols (or tannins) with formaldehyde, and their base exchange power is enhanced by treatment with sodium sulphite.

MOLDED INSULATION. Siemens-Schuckert Aktiengesellschaft. German P. 657,078, Feb. 19, 1935. Asphalt for molded electrical insulation is compounded with mineral wool and 3–5% of polyvinyl acetate.

ARTIFICIAL SPONGES. I. G. Farbenindustrie Aktiengesellschaft. German P. 657,286, March 17, 1933. Viscose sponges are attached to a paper, fabric or wood backing by wetting the backing with viscose solution, applying the sponge paste, and coagulating.

ARTIFICIAL HORN. Frederick S. Duncan. German P. 657,262, Jan. 29, 1934. Laminated artificial horn products are made by impregnating paper with a colloidal protein dispersion, winding on a mandrel, and keeping the material on the mandrel until the protein binder is thoroughly dry and hard.

MOLDED LENSES. W. E. Williams. British P. 475,035, May 7, 1936. In making lenses from synthetic resins by hot-press molding the die is first made truly spherical in the desired curvature, departure of the lenses from true sphericity after cooling is measured with an interferometer, and the die is polished accordingly, so that the cooled lenses will have true sphericity.

RIFLE STOCKS. H. W. K. Jennings (to Allgemeine Elektricitäts-Gesellschaft). British P. 475,080, Dec. 4, 1936. Stocks and butts for small arms are molded from paper or textile fibers with a synthetic resin binder, first by forming a hollow blank from a tube or sheet and finally by hot-press molding.

CENTRIFUGAL MOLDING. F. B. Dehn (to Röhm & Haas Aktiengesellschaft). British P. 475,552, May 18, 1936. Molding rods or tubes of vinyl or acrylate resins by polymerizing the monomer while under the centrifugal force imparted by a rapidly revolving metal or glass tube.

RUBBER RESINS IN LUBRICANTS. Texaco Development Corp. British P. 476,281, March 10, 1937. An oil-soluble resinous polymer derived from rubber, by depolymerizing with acetic or other acid and treating with a reagent such as stannic chloride or boron trifluoride, is used to increase the viscosity of mineral oil lubricants.

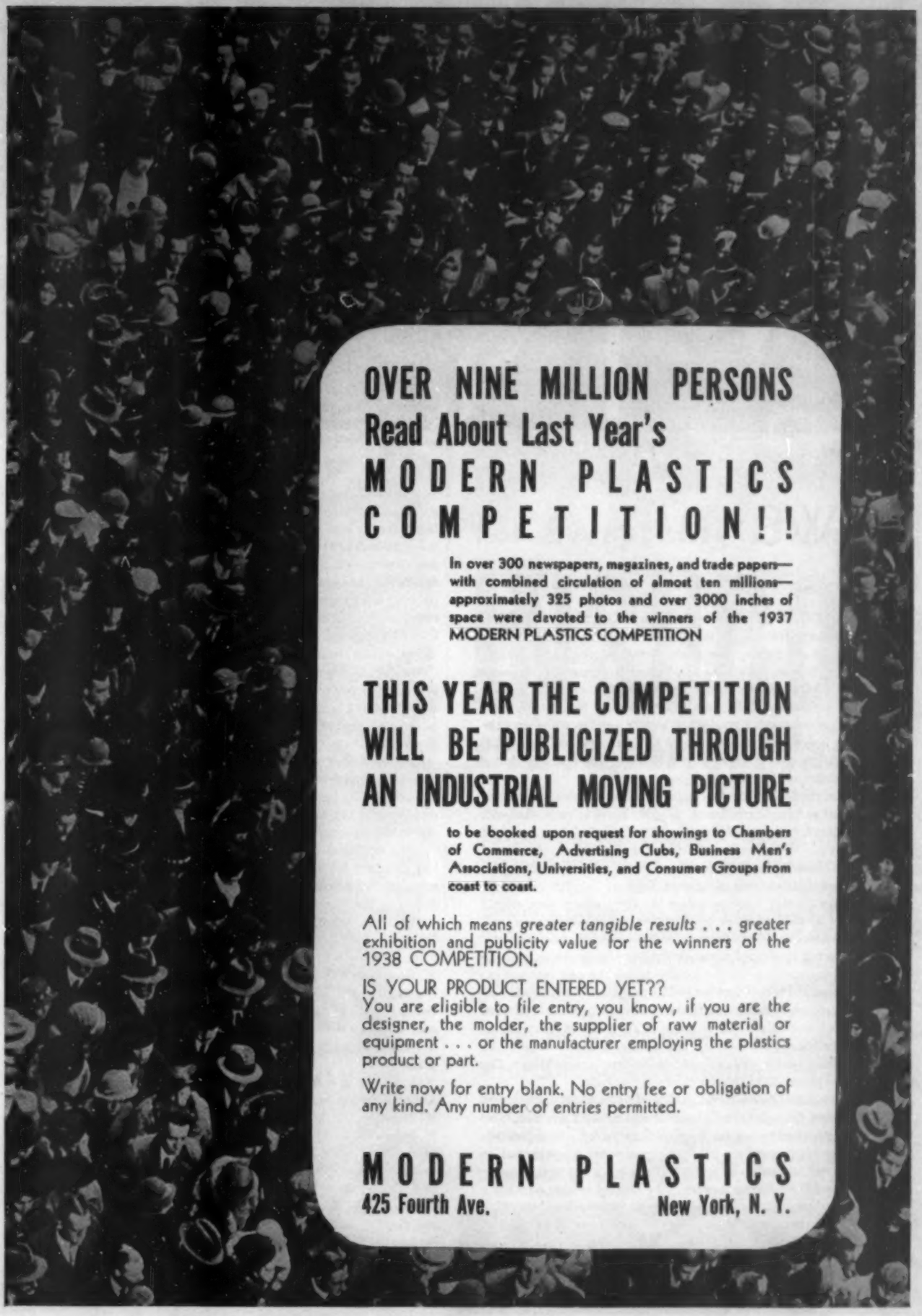
MOLDING POWDER. Max Koebner (to Dr. F. Raschig G. m. b. H.). Can. P. 372,599, March 22, 1938. Making molding powders by hardening a fusible phenol-formaldehyde resin in layers not more than 10 cm. (2") thick, at 50–70° C., and powdering the product.

CASEIN IN LACQUERS. D. A. Rankin and F. G. Uhler (to Canadian Industries Ltd.). Can. P. 372,620, March 22, 1938. Making a homogeneous dispersion of casein and a cellulose ether such as benzylcellulose by blending a cellulose ether dispersion (in alcohol) with a casein dispersion (in an organic solvent with sulphonated castor oil).

VARNISH RESINS. N. V. Industrielle Mij. vorheen Noury & van der Lande. French P. 819,829 and 819,830, March 27, 1937. Oil-soluble resins are made by condensing oleic, stearic, lauric or like acids, or a naphthenic or resin acid, with an oil containing hydroxy acid groups, e.g., castor oil or the triglyceride of hydroxystearic acid; and unproved varnish resins are made from these products by treatment with alkyd, vinyl, phenolic or other synthetic resins.

GRINDING WHEEL. Carborundum Co. French P. 820,369, April 8, 1937. A grinding wheel is made with a tough, flexible core of vulcanized fiber or the like, to which a fabric facing is cemented with a heat-hardenable phenol-formaldehyde resin.

PLASTICS FROM CORN. International Patents Development Co. French P. 820,049, March 31, 1937. Plastics made from zein (corn protein) and formaldehyde are plasticized with an ester or ether such as amyl salicylate, butyl lactate, dibutyl tartrate, cyclohexyl malate, diacetin, monobutyrin, diethyleneglycol monoamyl ether, butyleneglycol monobutyl ether, monocyclohexyl glycerol ether, etc.



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MODERN PLASTICS

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ALLAN W. FRITZSCHE

DONALD DEW

WILLIAM L. KELLY

NEWS

ALLAN W. FRITZSCHE, THE GENERAL INDUSTRIES CO., ELYria, Ohio, was unanimously elected president of the Society of the Plastics Industry for the ensuing year at the annual meeting of the Society held on May 23–24 at Buckwood Inn, Delaware Water Gap, Pennsylvania. Donald Dew, Diemolding Corporation, Canastota, N. Y., was elected vice president and William Kelly, Chicago Molded Products Corp., who has done such a good job as secretary and treasurer since the Society was inaugurated was re-elected to that same position. Paul Tietz, The Richardson Company, Melrose Park, Illinois, was elected assistant secretary and treasurer.

Directors of the Society for the coming year are: Herbert S. Spencer, General Plastics, Inc., North Tonawanda, N. Y.; Wallace F. Reibold, Waterbury Button Company, Waterbury, Conn.; G. A. Johns, American Insulator Corp., New Freedom, Pa.; Amos Blackinton, Associated Attleboro Manufacturers, Inc., Attleboro, Mass.; and Spencer E. Palmer, Tennessee Eastman Corp., Kingsport, Tenn.

The Monday evening dinner at which the above officers were elected was attended by more than one hundred members and their guests, representing fifty-two molding companies and materials manufacturers. It was conducted by Ronald Kinnear, retiring vice president, who reviewed the progress made by the Society during the past year and expressed the hope and belief that even greater progress would be made during the next twelve months. To further this end a committee of three was appointed to consider and recommend a planned program of activities for the Society and to report their findings to the directors at the October meeting which will probably be held at Lenox, Mass. The exact date and place will be announced in this magazine.

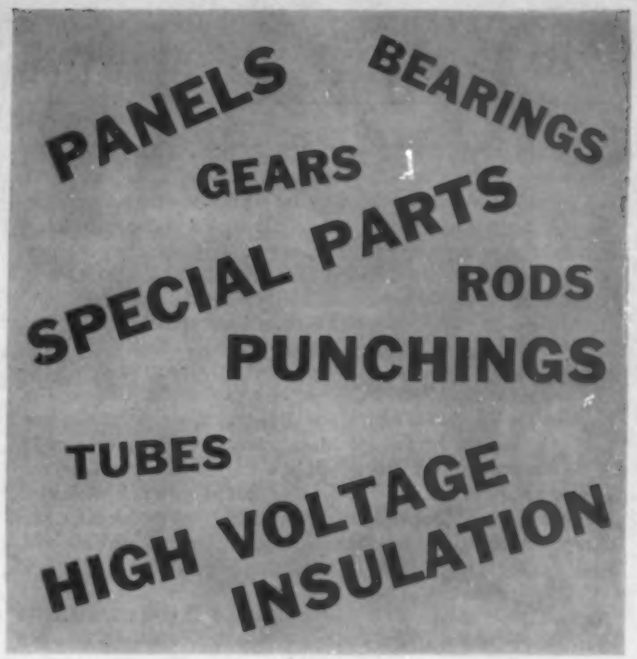
S. P. I. was originally conceived exclusively as a social organization and was lauched through the efforts and imagination of one man, Gordon Brown, sales manager of the Bakelite Corporation. It seemed too much to hope—and surely too much to expect—that the organization would take itself seriously and go beyond this point but to the amazement of many of the charter members, the retiring officers reported a sizable sum in the treasury and left a heritage of constructive ideas which if followed will result in substantial mutual benefits to all members of the plastics industry.

Until this meeting no serious speaker has ever addressed the gathering, but as a sort of trial balloon it was decided to attempt such a talk just to see what happened. A meeting was arranged for 9:30 A. M. Monday in the large lounge of the club where Mr. de Revere of the Ross Engineering Company was scheduled to talk about the Supertherm System of heating molds and platens with hot water instead of steam. More than fifty of the members attended. Mr. de Revere was introduced by Gordon Brown, and gave an intensely interesting description of the system, pointing out its advantages and limitations, as indicated by two important installations in the plants of Synthane Corporation and General Electric Company. Questions and discussion followed which occupied the balance of the forenoon.

Monday afternoon and most of Tuesday were devoted to golf, the tournament being played Monday afternoon. Among the prize winners were Allan and Sanford Brown, George Patterson, H. W. Paine, George Scribner, Dave Plume, D. S. Frederick, and Don Kendall. Awards were given in the form of cash prizes.

Each succeeding meeting brings in new members and it is earnestly hoped that, with a planned program of constructive activities which cannot help but benefit the industry and all those engaged in it, every molder and materials manufacturer will recognize these potential benefits and become interested to the extent of membership in the Society.

Those in attendance at the recent gathering included: Alex Adenbaum; Leo Adenbaum; C. H. Allin; K. N. Atwater; N. A. Backscheider; M. Barchard; A. S. Blackinton; C. W. Blount; Edward F. Borro; D. Rice Boschert; Chas. A. Breskin; Robert W. Brokaw; Allan Brown; Mr. and Mrs. Gordon Brown; Sandford Brown; David M. Buchanan; John P. Case; E. E. Chamberlain; Alan S. Cole; F. M. Cruse; R. H. Cunningham; F. K. Davidson; Donald Dew; R. E. Dodd; C. W. Douglas; Wm. J. Dunnincan; Harry Dent; C. J. Engman; E. G. Engman; D. S. Frederick; Lawrence W. Freeman; E. B. Funke; T. E. Giblin; Leslie B. Gillie; Wm. S. Grove; V. A. Gwyer; Edward Hagan; A. W. Hanmer, Jr.; R. B. Harrison; F. Heaton; Herbert Hoffman; E. Hemming; J. Horn; S. I. Howell; Chas. H. Hunton; W. G. Hirshfeld; Walter Jacobs; E. R. Johnston; C. L. Jones; W. A. Joslyn; H. J. Kasch; W. L. Kelly; D. S. Kendall; Ronald Kinnear; Fred Knoblock; George Kuhn; Chas. Lichtenberg; E. F. Lougee; Garland Lufkin; Kenneth W. Macksey; M. M. Makeever; Mr. and Mrs. Theodore Marvin; O. W. Marsh; R. T. Moore; S. T. Moreland; F. H. Morlock; Harold A. Myers; Harry J. McGowan, Jr.; James McIntosh; J. B. Neal; H. W. Paine; S. Palmer; Geo. Patterson; G. B. Perkins; C. Pickering, Jr; D. S. Plume; R. W. Post; E. F. Riesing; James L. Rodgers, Jr.; C. J. Romieux; Geo. K. Scribner; W. L. Searles; F. H. Shaw; C. L. Slaughter; Geo. H. Sollenberger; F. H. Sorensen; H. S. Spencer; Norman L. Stafford; G. M. Stone; John Swanson; Edwin A. Terkelsen; Mr. Toklaz; Wm. F. Torres; Edward W. Vaill, Jr.; H. G. Valentine; C. C. Van Deventer; A. R. Van Horne; Hans Wanders; C. H. Whitlock; Douglas Woodruff; M. V. Wright.



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New York Office: 7 West Street, Phone Whitehall 4-4487

NEWS

THE HYDRAULIC PRESS MANUFACTURING COMPANY HAS been selected by the Franklin Institute, Philadelphia, Pa., to play a major part in conjunction with a special exhibit of cellulose products. The company has accepted an exclusive invitation to display its injection molding press which has created so much favorable comment since its introduction at the Chemical Exhibition in New York City in December and at the recent Machine Tool Progress Show held in Detroit.

THE BAKELITE TRAVELCADE, WHICH DURING THE PAST TWO months has been exhibited to more than 45,000 visitors in New York City and many New Jersey cities will be opened to the public at The Franklin Institute in Philadelphia on June 16. Five new booths have been added and the lectures and demonstrations have been increased in both interest and scope. There will be a Preview for the press on the evening of June 15 when a select list of invited guests will be addressed briefly by Philip C. Staples, president of The Franklin Institute; and George Backeland, vice president of Bakelite Corp. Travelcade will remain at The Franklin Institute until December first.

TO FURTHER COMPLETE THEIR LINE OF CORROSION-RESISTant coatings, the American Concrete & Steel Pipe Co. announces the perfection of Amercoat Rapid-Dry Coating.

This differs from Amercoat Enamel and Amercoat Plastic in that it is not particularly designed to resist erosion and abrasion as well as corrosion. It is a quick-drying solution which may be applied with a paint brush or with paint spray equipment to form a protective covering for exterior and a lining for interior surfaces that are subjected to the corrosive action of liquids, gases, or solids.

THE AMERICAN CONSULATE GENERAL, FRANKFORT ON Maine reports that a special plastic seal has been manufactured in Germany for electrical meters, the locking of which occurs in association with the screw heads. Plastics are also being used, according to his report, as a substitute for imported lead for making seals for locking packages, measuring instruments, freight cars, and such, so that they may not be opened or tampered with without detection.

ANNOUNCEMENT OF A NEW DIVISION TO HANDLE THE SALE of rubber-like materials and synthetics to be headed by Dr. H. E. Fritz, has been made by W. S. Richardson, mechanical rubber merchandising manager of The B. F. Goodrich Company. Dr. Fritz, identified with the Goodrich Company for more than 13 years, has been in charge of the sale and development of Koroseal, a rubber-like synthetic material which is now being used in a number of industries.

GENERAL PLASTICS, INC., PLANS SOON TO BUILD A PLANT for the manufacture of synthetic phenol from benzol by the Raschig process. Since 1934 there has been in commercial operation in Germany by Dr. F. Raschig, G.m.b.H., a German corporation, a process for the manufacture of synthetic phenol from benzol and this company has granted General Plastics, Inc., an exclusive license in this country under the U. S. patents which it owns.

The principal raw materials used by General Plastics in the manufacture of its products are phenol, formaldehyde, woodflour, ammonia, dyes and pigments, all of which at the present time are purchased from other manufacturers. Of these, phenol constitutes the largest single item of raw material cost. By manufacturing synthetic phenol, the company expects to effect substantial economies in material costs and to provide a definite source where uniform quality can be controlled.

THE FORTY-FIRST ANNUAL MEETING OF THE AMERICAN Society for Testing Materials will be held at the Chalfonte-Haddon Hall in Atlantic City during the week of June 27. Committee D-20 on Plastics will meet on Thursday evening and its chairman, W. E. Emley, will present the first annual report of the committee at the Friday morning session of the Society. The five subcommittees will meet to discuss proposed test methods and to outline further test programs.

AUSTIN-HASTINGS CO., INC., DISTRIBUTORS OF MACHINE tools is sponsoring a machine tool, metal working and welding equipment Show to be held at the Boston Garden Exposition Hall from June 8 to June 11, inclusive. The company believes that manufacturers attending this exhibit may find ways of reducing manufacturing costs.

WALLACE B. ROSS HAS RECENTLY BEEN APPOINTED SALES manager of the Diemolding Corporation.

JOHN P. CASE, FOR THE PAST SEVEN YEARS PRESIDENT OF Consolidated Molded Products Corporation, Scranton, Pa., has resigned his position with that company. He states that he has made no immediate business plans.

THE NEVILLE COMPANY ANNOUNCES A NEW ECONOMICAL thermoplastic resin, identified as #465, manufactured on an entirely new principle in the modification of materials obtained from the coking of bituminous coal.

Its general physical properties are similar to those of coumarone-indene resins but the chemical properties are entirely different. Mimeographed specification sheets describing its properties and suggested applications have been released.

KURZ-KASCH, INC., ANNOUNCES THAT JOHN W. LOUGHEED, 521 Heyser Street, Jackson, Michigan, will represent the company in the state of Michigan.

INTERNATIONAL MOLDED PLASTICS, INC., ANNOUNCES THE appointment of F. W. Murray, 619 New Center Bldg., Detroit, as the company's representative in the Michigan territory.

TO BETTER CO-ORDINATE ACTIVITIES IN THE DEVELOPMENT and application of standards both within the company and without, General Electric has formed a new Standards Department. This organization will work with the various local, national, and international associations and agencies interested in standards and codes and will also promote the development of standards for use in the company's engineering and manufacturing department. The new department will be headed by L. F. Adams, who will serve as manager and assistant to vice president E. O. Shreve. Associated with Mr. Adams will be E. B. Paxton, E. R. Anderson, H. W. Samson, and H. W. Robb.

The formation of the Standards Department centers in one organization the work formerly done by smaller groups throughout the various General Electric plants. At the same time, however, the several standardizing committees already established by the company will continue to function in the development of apparatus in their respective lines.

THE JOINT COMMITTEE ON RADIO RESEARCH ANNOUNCES IN a recent report that in 36,641,000 American homes there are 26,666,500 radios in operation. The Joint Committee is sponsored by the American Association of Advertising Agencies, Association of National Advertisers, and National Association of Broadcasters.

THE MEYERCORD COMPOUND LUMBER COMPANY IS PRODucing veneers in sizes up to 6 feet by 10 feet. This increased size has been made practical for commercial purposes, owing to the improved methods of drying the sheets at only 130 deg. F., in a specially designed drying kiln. The process eliminates acids and salts that cause case hardening, hence checks and split pieces have been practically eliminated, and waviness, inherent in ordinary veneers, has been reduced.

As a result, there is far less waste for the plywood manufacturer, enabling him to produce panels that are more economical to handle at a price that compares favorably with resinous western veneers. At present the veneers produced are largely southern hard woods.

A NEW MOLDING COMPOUND IS ANNOUNCED BY GENERAL Plastics, Inc., to be known as 2274. This material was developed to meet the problem of molding parts with especially large inserts which are subject to extremes of temperature. While this new 2274 compound is comparable with standard compounds, the final set is slightly more flexible. Therefore cracking is avoided in the finished piece which otherwise occurs with expansion and contraction of the metal inserts. 2274 is especially adaptable with terminal studs, brush holders, etc.

to know the meaning of "Molded by Stokes"

Whether you have but a sketchy idea or complete blueprints, STOKES has the facilities to turn out an entire molding job from design, through machining the molds to molding the finished piece. Our equipment is extensive enough to assure economical production, on a large scale, of large size moldings.

Here is a clock case MOLDED BY STOKES for the Sessions Clock Company—an original design by Mr. Frederick E. Greene of the Stokes designing staff. The case combines sturdy construction with the kind of sales appeal that insures quick and profitable turnover. We'd be glad to serve you along similar lines.

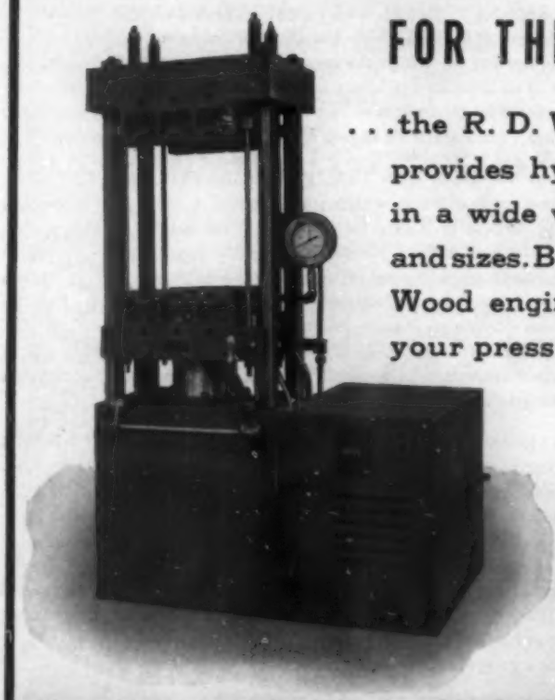
JOSEPH STOKES RUBBER CO.

322 Webster St.
TRENTON, N. J.

Canadian Plant
WELLAND, ONT.

MOLDERS OF ALL PLASTICS—*including*
HARD RUBBER—SINCE 1897

FOR THE PLASTICS INDUSTRY



. . . the R. D. Wood Company provides hydraulic presses in a wide variety of types and sizes. Be sure to consult Wood engineers regarding your press requirements.

(Left) This 50 ton HydroLectric precision type molding press is operated by a two-pressure rotary pump at 200 pounds low pressure and 1000 pounds high pressure.

A 30 ton HydroLectric laboratory press with variable pressure pump and loading elevator. Pressure range—2 to 30 tons.

ESTABLISHED 1803 **R. D. WOOD CO.** PHILADELPHIA, PA.

HYDRAULIC PRESSES and VALVES for EVERY PURPOSE

PUBLICATIONS

Booklets reviewed in these columns will be sent without charge to executives who write for them on their company letterheads. Other books will be sent postpaid at the publishers' advertised prices

Design for Discussion

by Leslie Brewer

Foreword by Clough William-Ellis

Published by Methuen and Co., Ltd., London

Price 1/3 plus postage

To quote from the Foreword, "Design for Discussion is not a book but a provocation; an interrogation, a challenge. But to its questions 'Why?' ingeniously repeated in many different forms, no authoritarian ready-made catechism is laid down by way of answer."

It is, however, an amusing treatise on Design in which pertinent questions are so interestingly asked and illustrated that it promotes thought along intelligent lines which cannot but help to stimulate interest in this important subject.

Beginning with animals and why Nature designed and colored them as they are, the book progresses through common place products, household accessories, architecture, interiors, shop windows, to the grave where tombstones of our forefathers are compared with those of our recent generation. There is more substance for thought in these thirty illustrated pages than in any design opus I have ever read. Grand for teachers and students. E. F. L.

Principles of Organic Chemistry

by H. P. Starck

Chemical Publishing Co. of N. Y., Inc., New York, 1938
Price $5.00 **664 pages**

This book has been written especially for a course designed to prepare students for pre-medical or general examinations in chemistry. It might be said to be an outline of organic chemistry, which is about all one can do in a single volume today. In the Theoretical Part the methods of preparation and the reactions of the various aliphatic and aromatic compounds are enumerated. As a further aid to the student numerous tabulations of the characteristics of the different classes of compounds are presented. Essential definitions are printed in bold type. The Practical Part covers experiments on the identification, preparation, and estimation of organic compounds. G. M. K.

Engineering Materials and Processes

by W. H. Clapp and D. S. Clark

Published by International Textbook Company, Scranton, Pa.
Price $4.50 **543 pages, 371 illustrations**

The properties and uses of engineering materials and the shop methods by which they are processed are reviewed in this text, which is based on a one-semester course presented to engineering students at the California Institute of Technology. Although concerned primarily with metals, a special chapter on "Plastics and Plastic Molding" written by R. B. Stringfield is included in recognition of the fact that "their lightness, strength, resistance to corrosion, color and ease of production render plastics important additions to the list of materials of construction."

Your Place in Life and How to Find It

Published by The Trailblazers, Champaign, Ill.

Paper cover, 25¢ **128 pages**

This is a handbook of opportunity for youth in which 22 different industries are described and detailed to explain to young people just what opportunities exist in each. Chapter VII which is devoted to plastics is written by E. F. Lougee, Editor of MODERN PLASTICS. The book is distributed through chain stores or will be mailed postpaid upon receipt of twenty-five cents in coin or stamps.

A NEW EDITION OF THE BOOKLET "THE VERSATILE SERVICE of Bakelite Plastics" has just been published by Bakelite Corp. This sixteen-page booklet tells the history of modern plastics from the time of their discovery by Dr. L. H. Baekeland up to the present day, when they are being used by practically every industry in one form or another. The booklet points out that few people have failed to hear of plastics, but many know only of some special application—perhaps a cigaret holder, the modern handset telephone, an automobile timing gear or a radio cabinet. The story of Bakelite plastics—what they are and how they are used—is told in concise, entertaining style.

THE FIBERLOID DIVISION OF MONSANTO CHEMICAL CO. HAS published a 24-page booklet describing its various plastic products. Injection and compression molding are described and there is an interesting chapter on mold design. The booklet is well illustrated in black and white and three 4-color plate pages to picture the color range of Fibestos. Many finished products are shown.

GENERAL ELECTRIC COMPANY HAS ISSUED SEVERAL BULLetins on Direct-Current Motors, Magnetic Motor Starting Switches, New Track-Type Limit Switch, Reconditioning Flooded Electric Equipment, Direct-Current Generators and Excitors as well as Gear-Motors.

CONTINENTAL-DIAMOND FIBRE CO. OFFERS A NEW 48-PAGE booklet describing Dilecto, a laminated phenolic material. It is written for the engineer and designer who want the facts to apply to their own problems of construction and design. The manufacture of the material is illustrated, its properties charted, its applications explained. This company has also recently published booklets on Haveg for Corrosion Resistant Chemical Equipment; Diamond Vulcanized Fibre; Molded Celoron (phenolic laminated gear material); Dilophane, a translucent laminated phenolic in gay colors; and Vulcoid, a laminated fibrous base insulating material.

VOL. 1, NO. 2 OF THE NEOPRENE NOTEBOOK PUBLISHED BY E.I. du Pont de Nemours & Co., Inc., is largely devoted to uses of Neoprene in the oil industry. It indicates where Neoprene compounds can be used with greater advantage than even the best rubber compounds where such materials must resist ozone, oil and heat.

THE RICHARDSON CO. HAS PUBLISHED A 24-PAGE BOOKLET called Insurok Molded which describes not only the molding materials and equipment for which the company is well known, but illustrates many of its laminated products as well. It sets forth the technical service offered by the company, lists Insurok specifications (both phenolic and urea), concludes with an imposing list of products turned out.

THE BULL DOG ELECTRIC PRODUCTS CO., HAS ISSUED A twelve-page booklet in which they describe a more convenient and flexible method of wiring for industrial plant building. This system called the Trol-E-Duct System was briefly described in the story "Progress Through Expansion" in our April issue, but the pamphlet goes into much more detail of this very modern method of lighting installation and shows a great many examples of its practical applications.

Bustribution—a distribution system permitting rapid yet permanent and safe connections for power in factories with changing plant layouts is also described.

THE 150-PAGE SPIRAL BOUND CATALOG NO. 5 LISTING AND describing chemical, bacteriological, pharmaceutical, medical, engineering, electrical and general scientific and other technical books of all American and British publishers, offered to technical workers by the Chemical Publishing Co. of N. Y., Inc., met with such a great demand that it is now out of print. Catalog No. 6 is now ready and will be mailed to any chemist, engineer, scientist or professor sending *10¢ in stamps or coin* to cover mailing. This catalog eliminates the necessity of filing and looking through catalogs of many technical publishers—thus saving a great deal of time and effort.

GLYCO PRODUCTS CO., INC., PUBLISHED A SERIES OF CIRCUlars describing Water-Soluble Resins, Synthetic Waxes, Emusifying Agents, Foam Reducers and Flameproofing materials.

A TWENTY-PAGE BULLETIN NO. 503 ON INDUSTRIAL MIXERS is now available from the Ransome Concrete Machinery Co.

INGENUITY

BEAD CHAIN

Trade Mark Reg. U. S. Pat Off.

BEAD CHAIN* has strength adequate for its size. Even the smallest chain has a tensile strength of 15 to 20 lbs., and the largest from 175 to 200 lbs.

IT CHALLENGES INGENUITY

BEAD CHAIN* was originally introduced for use with electrical pull sockets, but its strength, smoothness and the fact that it will not kink nor tangle has resulted in many ingenious, practical and sales producing uses.

•

As a manufacturer you very likely have a product problem that swiveled BEAD CHAIN* may help you solve. Our engineering and design service is prepared to cooperate with you.

•

THE BEAD CHAIN MANUFACTURING CO.
60 Mt. Grove St. Bridgeport, Conn.

* Trade Mark Reg. U. S. Pat. Off.

CHARMS or OIL CANS
The Same Standard of Excellence When Molded by
Universal

UNIVERSAL conceived and developed this *transparent* oil-can. And now it seems *everyone* wants a Scan-Can, the oil container that lets you see *what's inside and how much!*

CHARMS TO INCREASE SCHENLEY'S SALES . . . to add a clever spark of sales-appeal to Schenley's bottles. Superb in detail, ivory-like in finish. You'll see them from one end of the country to the other.

AIR-KING is one of the smallest radios on the market . . . and one of the lowest priced . . . nevertheless its cabinet must be as attractive, as well-styled and as finely finished as those costing more.

The plastic Delynip pourers developed in cooperation with UNIVERSAL, saved on cost, added appeal, and increased sales *tremendously*.

If your problem is one of finding a new market . . . of increasing sales . . . of producing a plastic product within limited costs . . . come to UNIVERSAL. We are concerned with making moldings do *a better job* for you and your product. We have the facilities to turn out plastics of all kinds. But more than that—we *create* as well as mold.

Write . . . and one of our consultants will gladly call on you.

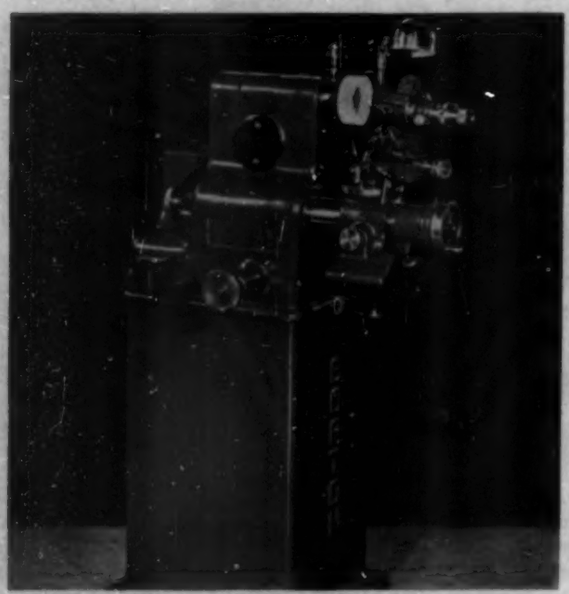
UNIVERSAL PLASTICS CORP.
NEW YORK OFFICE: 50 E. 42 ST. NEW BRUNSWICK, N. J.

EQUIPMENT

THE DESIGN OF THE REED-PRENTICE 10-B INJECTION PRESS has been changed since it was announced in our last issue and we have been informed by the company that the 4 oz. capacity machine provides for 30 sq. in. at maximum pressure of 28,000 lbs., and 40 sq. in. at pressure of 19,000 lbs., while the 6 oz. capacity machine provides for 50 sq. in. at a pressure of 16,000 lbs.

A NEW MILLING MACHINE CALLED DECKEL F P I DESIGNED to meet plastic die and mold production requirements is announced by H. P. Preis Engraving Machine Co. The following features are incorporated in the design: detachable work table that tilts in all directions; swiveling vertical speed milling head, in addition to horizontal milling head with arbor support; swiveling high speed vertical milling head with self-contained motor drive; swiveling dividing head and swiveling slotter with stroke up to 3 inches.

CUTTER GRINDER, 375-2, A RECENT ADDITION TO THE LINE of George Gorton Machine Co., is designed particularly for grinding the highly efficient, time and money saving single flute cutters, which cannot be ground properly on standard types of cutter grinders. It will also grind other types of small cutters, not over five-eighth in. shank,

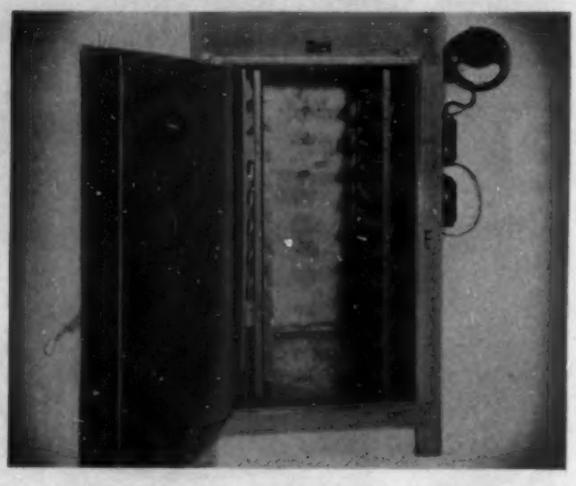


used in die and mold cutting and pantograph engraving and profiling work—two and four flute cutters and cutters with two, three, or four sides or flats.

The 375-2 Grinder equipped with Universal Tool Head 717-1 will grind cutters to any desired diameter, taper, shape or clearance, and with square, conical or ball nose. An index dial and plunger is provided for grinding cutters with one, two, three, or four sides. There are micrometer dials on all adjustments.

Carbide cutters may also be ground in any of the above shapes and sizes on interchangeable diamond impregnated wheels. Straight cup wheels are furnished for single flute cutter grinding, and flaring cup wheels for multiflute and spiral flute cutters. This Cutter Grinder has been built for the most exacting work. It is completely ball bearing, with all bearings dust proof and running in oil. Simple, positive adjustments for wear are provided at vital points.

HAROLD E. TRENT CO. HAS DEVELOPED AN OVEN FOR NORmalizing synthetic moldings, and taking the strains out of such moldings after assembling. The heat in contact with the work is one-hundred percent convection heat, and not radiant heat. Air circulation is positive, and is so deflected as to maintain even heating throughout the oven. The shelving arrangement can be made to suit the requirements of the customer's pieces to be normalized.



Simultaneous temperature readings taken in an oven of this description have shown a maximum variation of one degree F. The energy of the oven is quite small, the maximum being 4 KW., which can be reduced by means of three-heat switches to a very low value. The temperature control consists of any standard make and can be either indicating or recording controlling, depending on the customer's requirements.

THIS 12-INCH DIAMETER STEEL MILL BEARING OF LAMInated phenolic is being cut to the proper segment arc by a specially developed circular saw manufactured by The Huther Brothers Saw Manu-

facturing Co., Inc. The saw teeth are tungsten carbide tipped and the saw is segmented with five teeth to a segment so that a damaged tooth may be quickly replaced without complete loss of the saw.

WAYNE AUTOMATIC RELAY CO. ANNOUNCES THE DEvelopment of a new type photo-electric counter unit that is a radical departure from all previous types in that it uses a standard mill type lamp, and no expensive light source that requires focusing adjustments, as well as frequent lamp renewals.

The unit is wholly self-contained, has an ingenious light louver system to exempt all extraneous lights, and a highly corrected condensing

Delta drill presses in the plant of the Dictograph Products Company, makers of the Packard Lectro-Shaver. These drills are used for dozens of operations in plastics plants, making worth-while savings in drilling and tapping costs.

Let us send you complete data and prices on these low-cost, high-efficiency drill presses. Also on Delta belt and disk abrasive finishing machines, which are saving money for many plastics manufacturers. Write for literature today.

Delta Manufacturing Company

628 E. Vienna Ave. Milwaukee, Wis.

"A Natural"
FOR YOUR FINISHING DEPARTMENT

Delta drill presses are a natural selection for fast drilling and tapping in your finishing department. They are the choice of most large plastics manufacturers for very definite reasons. A few of these reasons are:

- *Low First Cost.* Delta drill presses are built for industrial use, but are as low in price as many "home-workshop" machines.
- *Minimum Maintenance.* Equipped with double-seal ball bearings throughout, Delta drills never require lubrication and practically no maintenance.
- *Complete Portability.* Delta drills require no special wiring, but can instantly be moved to any part of the furnishing department as required by operating conditions.
- *Ease of Operation.* Light, sensitive operation and handy controls make them ideal for use by unskilled operators, men or girls.
- *Low Power Consumption.* Delta 11" and 14" bench and floor drills require only 1/2 H.P.
- *Long Life.* Standard Delta 14" drills have run 16,016 hours—over four years, 14 hours a day—with no cost for repairs beyond the replacement of a few inexpensive V-belts. And they're still running!

THE *Speed Nut System*

NOW-

TAKES COMMAND!

Why? Because SPEED NUTS are such a "natural" for plastics, you'd think plastics were developed just for SPEED NUTS.

In any plastic assembly they actually "zip" on. Inserts are eliminated, along with their costly handling requirements. Mold costs are subsequently reduced as well as that handling time. By employing SPEED NUTS over integrally molded studs, it is now possible to manufacture parts of molded plastics where high mold costs and higher piece costs formerly prohibited it.

IN PLASTIC ASSEMBLY

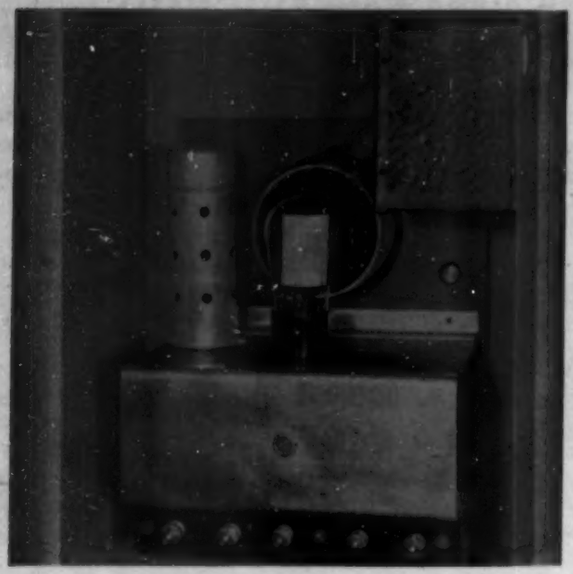
Write for new illustrated folder showing various applications. If you want samples, kindly state sizes and uses you contemplate. Or if you have a particularly tough assembly problem requiring a peculiar shape, let our development engineering department get to work on it.

SPEED NUT DIVISION

TINNERMAN STOVE & RANGE CO.

Manufacturers of Patented SPEED NUTS
2048 Fulton Road Cleveland, Ohio

EQUIPMENT



lens to direct the full light energy upon the photo-cell. Atop the steel cabinet is an amber light that signals each step of the counter cylinder, and thereby protects the managements against either non-operation or malicious tampering. Some plants cover a small section of the conveyor as an added protection, placing the counter in a midway position. Three quarters of an inch separation of parts will serve to actuate the counter unit, on 110 volts AC or DC current supply. The hinged cover has provision for locking the reset feature of the counter.

AN ELECTRIC ETCHER FOR PERMANENTLY MARKING ON metal surfaces has been announced as the latest addition to the line of electric tools, manufactured by the Ideal Commutator Dresser Co. Used in the same manner as an ordinary lead pencil, the Etcher writes, prints or marks on tools, gauges, dies and hard metal parts.

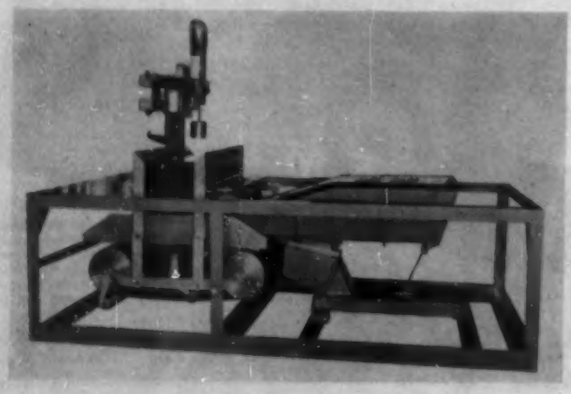
NOW AVAILABLE IS AN AUTOMATIC, CONTINUOUS WEIGH feeder that provides a steady flow of bulk materials such as coal, dry chemicals and foodstuffs by weight per hour to a constant, close accuracy. The machine is made up of a vibratory feeder conveyor discharging onto a constant speed belt conveyor suspended from a scale having sensitive electric valves.

A constant load, by weight, is maintained at all times on the conveyor by the ability of the vibratory feeder to speed up or slow down its discharge as controlled by the electric valves which function on the slightest under-weight or over-weight movement of the scale beam.

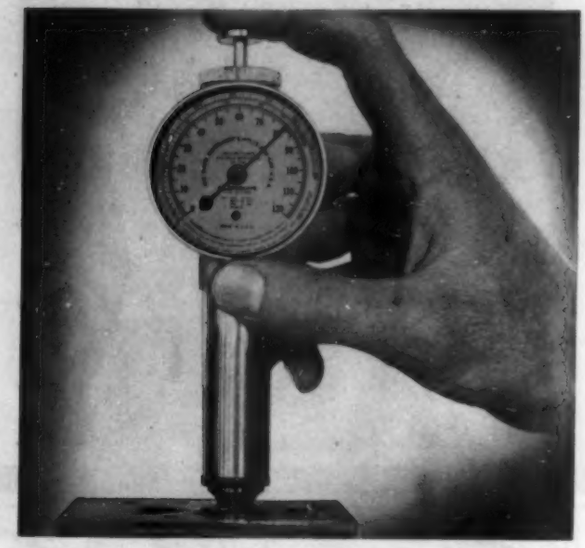
A synchronous motor drive insures a constant belt speed. The scale functions purely as a scale, exerting no mechanical power to operate its electric control valves. The feeder is of the pulsating, electromagnet type conveying bulk material by vibration, so it flows like water.

The machine's ability to automatically maintain a constant load on a constant speed belt provides practically one hundred percent accuracy of feed by weight.

Complete catalog information on machines ranging in capacity from 25 lbs. to 25 tons per hour is available from the Syntron Company.



A POCKET SIZE INDICATING HARDNESS TESTER IS DEveloped by The Shore Instrument & Manufacturing Co., Inc., and is so designed that it can be operated as readily as an automatic center punch. A diamond pointed hammer is used together with a new improved clutch mechanism. With suitable attachments, tests can be made in a bench vise on a surface plate, as well as free-handed. The instrument proper is only 6 inches long and weighs about 1 pound. In making hardness tests, the instrument is placed on the work and the button on top of the barrel is then pressed down. The pointer automatically indicates the hardness on an enclosed scale.



A NEW LINE OF SCREENS BUILT IN SINGLE OR MULTIPLE deck, open or closed, level or pitched models, powered by the Ajax-Shaler shaker is announced by the Ajax Flexible Coupling Co. These Vibroplane and Angleplane screens provide increased capacity per unit of cloth area, greatly reduced tendency to "blind," extremely close separations, elimination of abrasive action on material being screened and unusually low power consumption. Complete information is available in a recently published folder.

UNIQUE BLOOD SYSTEM MODELS PREPARED WITH VINYL RESINS

Corrosion specimens showing the distribution of blood vessels in organisms, such as the kidney, heart, and lung, are prepared by a more rapid method which has been made possible by the unusual chemical-resistant properties of Vinylite, a vinyl resin according to the results of recent research by Dr. J. K. Narat, J. A. Loef, and M. Narat of Chicago, Illinois. The extreme chemical stability of vinyl resins also offers for the first time the opportunity of using acid-fast dyes which make possible multicolored specimens with red arteries, blue veins, yellow ureters, and green biliary ducts. The resin is injected as a solution into veins, arteries, and

other ducts and is allowed to solidify. The specimen is then immersed in 38 percent hydrochloric acid for about three days which disintegrates the tissue completely but does not attack the acid-resistant vinyl resin. An exact, accurate reproduction of the actual arrangement of the system is thus preserved as a plastic model for future demonstration, study or diagnosis.

Although corrosion specimens have been prepared since 1685, the injection experiments up to now have not been satisfactory. Paraffin, white wax, and resin become soft in warm weather, and the entire specimen easily wilts and collapses. Various cellulose nitrate solutions made from discarded x-ray film have been used. But these methods required a slow injection which took much time, and the desired specimen had to be kept immersed in a weak corroding fluid for many weeks or even months.

Satisfactory results can now be obtained more rapidly by using a 12.5 percent solution of vinyl resin in acetone. This is the most suitable concentration because such a solution is not too thick to enter the finest branches of blood vessels and yet coagulates with sufficient speed after injection. These resins possess low moisture absorption, so that these biological specimens or anatomical models of the human or animal body will not warp, bend, or crack, but will retain their shape permanently. These corrosion specimens are not brittle, but have excellent structural strength and will stand handling without requiring special mountings.

Corrosion specimen of human kidney, showing the actual arteries in red color and veins in blue color, made from acid-resistant Vinylite resins

As can be readily deducted from the above facts, vinyl resins are highly resistant to chemical fumes, acids, alcohols, weathering agents, fats and oils, greases, and practically all corrosive agents. Due to this extreme chemical inertness, these resins are used in a lacquer to protect chemical equipment, medicine cabinets, and laboratory equipment against the action of corrosive liquids and fumes. They will withstand the high alkalinity of cement and will not blister on concrete and cement-asbestos boards. Food and beverages can be stored in cans lined with these resins indefinitely without effect on either the contents or the coating.

NATIONAL

RESIN COLORS

BRILLIANT
UNIFORM

•

A COMPLETE LINE OF COLORS SPECIALLY MANUFACTURED FOR BOTH MOULDED AND CAST PLASTIC COMPOUNDS

•

WE INVITE YOUR PROBLEMS

•

NATIONAL ANILINE & CHEMICAL COMPANY, INC.
40 RECTOR STREET NEW YORK, N. Y.

BOSTON • SAN FRANCISCO • ATLANTA
PROVIDENCE • CHARLOTTE • CHATTANOOGA
CHICAGO • GREENSBORO • PORTLAND, ORE.
PHILADELPHIA TORONTO

Branches and Distributors throughout the World

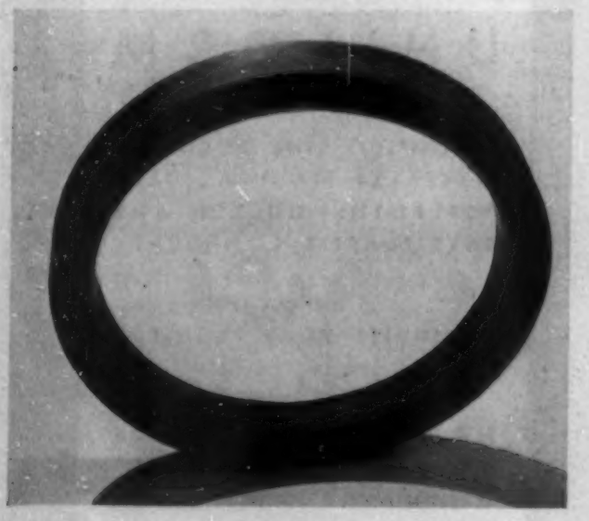
RESIN DYES

LONGER LIFE GASKET

When the simple substitution of a material in a part makes possible a monthly saving of approximately four times the value of that part, and continues the saving for twenty months, that's NEWS. Add to this the elimination of lost time while repairs are being made, the trouble and expense connected with ordering repair parts, and similar items, and the magnitude of the saving becomes even more impressive.

The part which enabled this substantial saving was a simple hydraulic press gasket, shown in the accompanying illustration. This gasket is used on a hydraulic press, using oil and the hydraulic medium, having a 10-inch ram, operating at 1,500 pounds per square inch from a Hele Shaw pump. The press is used to vulcanize test slabs in the laboratory of E. I. du Pont de Nemours & Co. The original gaskets were of leather.

These first gaskets regularly failed after ten days to two weeks service. Further, during a period of four months when leather gaskets were used, the oil leakage averaged nearly five gallons per week. At the very minimum figures for gaskets, oil and labor of replacement, the maintenance of this part cost $20 per month.



Gasket made of Neoprene, a rubber-like material, manufactured by E. I. du Pont de Nemours & Co., Inc., is giving much longer service than the leather gasket it replaced

Inasmuch as this seemed to be an excessive amount for one small part, a gasket made of Neoprene, chloroprene rubber, which does not deteriorate upon exposure to heat, and oil, was substituted for the leather gasket. The original Neoprene gasket was installed in March 1936. It is reported to be still in service, having been in use since that time, and at all times it has been subjected to the heat from the steam heated platens. The steam lines to the platens have conducted steam continuously at 60 pounds pressure. This almost phenomenal service is in itself an indication of the tremendous saving effected, but what is probably of equal importance is that it has not been necessary to add oil to the hydraulic system since the installation of the Neoprene gasket.

Neoprene gaskets are also reported to be superior to other types in services where water is the hydraulic medium. They retain their strength and are not deteriorated rapidly by heat or by any oil or grease used to lubricate the ram.

THERMOPLASTIC PRINTING TYPE

(*Continued from page 36*) stoffletter" is not only being used as standard movable type, set by hand, but is also used in typesetting machines. The inventors of the type appear well-satisfied with its durability and certainly have had ample opportunity for tests as Engineer Strunk has long been connected with the Deutscher Verlag A. G., formerly the Ullstein A. G., one of the largest publishing companies in Germany.

It is interesting to consider that it took plastic material to finally provide the substitute in printing for the alloy of about 5 percent tin and up to 30 percent of antimony with 65 percent lead. On typesetting machines the usual alloy is 4 to 6 percent tin, 10 to 12 percent antimony and 82 to 86 percent lead. A particular point made by the inventors is that the plastic does not tend to oxidize but after repeated re-casting, the type metal, according to Engineer Strunk deteriorates rapidly as the tin is eliminated from the content. The dust factor as affecting printers' health is also claimed to have been greatly improved with the plastic.

The plastic used is stored in a melting chamber attached to the type-founding machine. In typesetting machines, the keyboard, setting devices and the lock up and later distribution of type are unchanged from traditional practice. Certain changes are made in the melting heat and at the prescribed temperature the plastic is pressed through nozzles into the matrices. The process corresponds to die casting or in the case of plastics—to injection molding. After use in a form, the synthetic resin letters may be washed with benzine or other cleaners and do not suffer from humidity or corrosion. The elasticity is claimed to be higher than that of type metal, which indicates lower wear, so that the type should stand up as well or better than lead alloy.

In addition to the claim of the inventors that forms of plastic type weigh only one-tenth the usual weight, it is further pointed out that with lighter forms, the presses may be constructed lighter without a decrease of the force necessary for clear impressions. The centrifugal forces to be balanced in large presses, it is said, are reduced by one-third when plastic type is employed. This of course implies a substantial reduction in vibration, often an important and difficult problem to solve in a structure containing a large number of printing presses operating at the same time.

Experimental work is continuing. Laboratory work had to be carried out with extreme care, especially in securing sharp outlines of letters after casting and following some wear, as the contrast between plastic and metal type is only a difference of a few milli-millimeters. Seeking further information after the above had been

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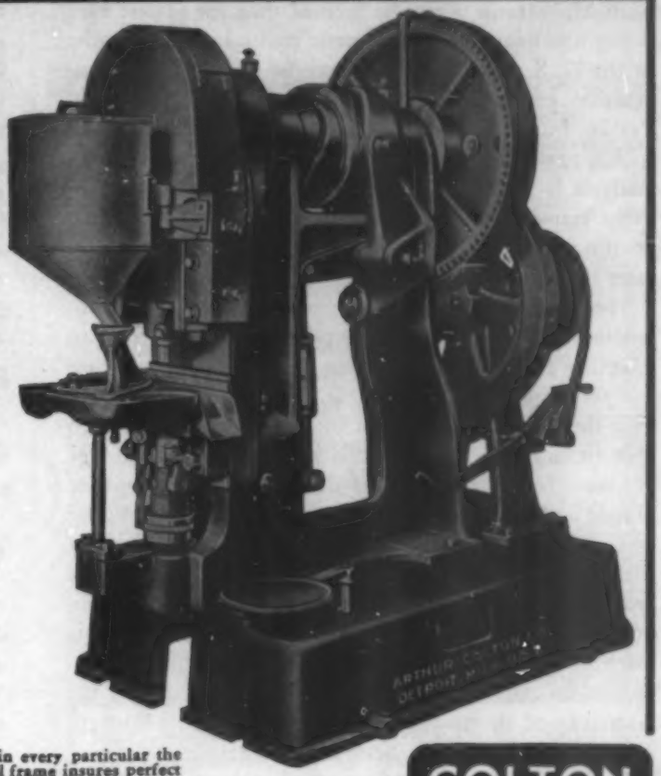

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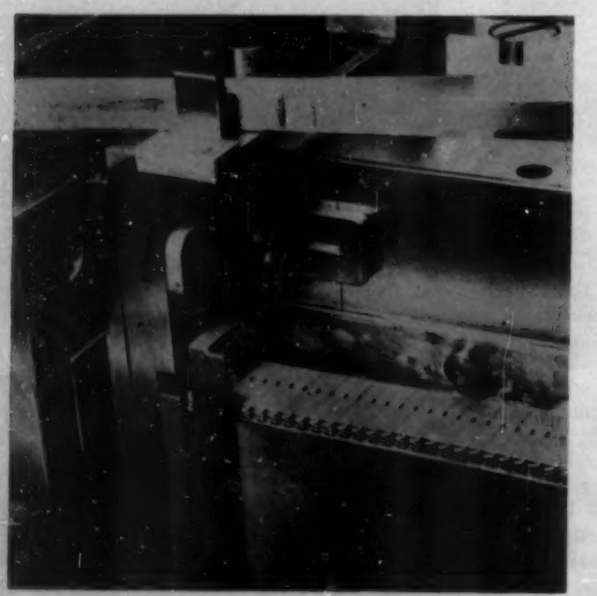
written, your correspondent arranged a special interview with Mr. Strunk where he learned that the plastic used is not identical with the styrene resins known to those in the U. S. A. Polystyrol may be added to the composition employed by Mr. Strunk and the Deutscher Verlag, but in the main it is a special composition, in which several carbohydrates are available. The exact analysis is still kept secret. The substance was originally transparent, but as this proved impractical for printing, it was colored gray, the color turning brown after repeated re-melting.

The process was naturally applied first to hand composition. Experiments undertaken with a view to adapting the plastic to existing linotype machinery are not yet quite finished. But Mr. Strunk is quite positive that there are no difficulties in the way. He has been able to cast the material into the matrices under *high* pressure, which is the chief difference between use of plastic and the present type metal in machines. While comparatively large quantities of molten type metal are stored in a linotype, only small quantities of the plastic are made viscous in the electrically heated melting chamber of the Strunk machine. The lack at present on this machine is a device to provide sufficiently high pressure. Otherwise, the automatic feeding of the material, the matrices and in general the construction of the linotype are the same for either plastic or type metal.

It cannot be expected, of course, that the new machines will revolutionize printing in a day. The inventor, himself, expects only a gradual introduction of the new kind of type material. But Mr. Strunk claims to have been led to development of plastic type, not by the present situation in Germany with respect to raw materials, but, many years ago, because of the obvious advantages of plastics over type metal.

At present, in the application to a typesetting machine, only 4, up to in some cases 10, castings may be effected per minute. This might suffice for linotype machines, but for single-type casting, where we are accustomed to speeds of 3000 to 4000 letters per hour, this is slow. Though Mr. Strunk claims to have developed means for overcoming this difference in speed of casting, no information was forthcoming on this point. The remedy, he indicated, may consist in casting a large number of letters at one time. One kilogram of type plastics is much more expensive than one kilogram of type metal, but the prices are about equalized by the fact that 8 to 10 times more type can be produced with a given weight of plastic.

Casting machines for synthetic resin type



FOR RAPID ASSEMBLY

(*Continued from page 33*) hub walls are thinner and much molding material is saved through this type of knob construction. The hub may be molded to accommodate a D-shaped shaft to prevent turning, or a round shaft with knurled end may be inserted in a round hub. The spring clip is a simple compression ring that eliminates inserts entirely. It is snapped over the slotted hub with a special tool developed for the purpose; providing a speedy and economical assembly and strong holding power. When applied to thermoplastic materials, it overcomes cold-flow tendencies.

Fig. 3 shows two types of knobs and shafts assembled with spring clips, one round, the other D-shaped. Instead of using internal pressure exerted outwardly, this clip reverses the process by exerting a contractular pressure which keeps the plastic molding confined to its original shape. It is adaptable to almost any size or shape of plastic knob.

Fig. 4 shows the inside of a radio cabinet with integrally molded plastic studs. The rectangular white spots show the spring tension nuts which have replaced lock washers, threaded nuts and inserts which were formerly used in many such assembly jobs.

Fig. 5 illustrates the plastic assembly of an automobile instrument panel. Notice the three integrally molded studs formed on a curve, as diagrammed in the right circle; and the D-shaped stud, shown in the left circle, which permits removal of knob. The spring tension nature of the grip naturally intensifies that grip when increased pull on the knob or plastic part occurs.

These fastening devices may be had round, rectangular, U-shaped or L-shaped as the application demands. They are made in single or multiple units so as to engage one, two or more plastic studs at the same time for quick assembly. In fact, special shapes and designs can be produced to accommodate almost any engineering problem of fastening and their cost is exceedingly low.

As plastic moldings increase in size, sectional construction will become common practice. Large floor-model radios will become practical through this method as will other housings which have been limited only by the size of available presses and molds—and a satisfactory method of fastening these sections into a unified whole will speed this technique of production into new and untried fields.

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(*Continued from page 41*) they will be exposed. Their recommendations are shown in Table 7. The German VDE 0303 Specification for the determination of electrical properties of insulating materials provides for conditioning at relative humidities of 65 or 80 percent at room temperature (20° C. ±5°). The time of conditioning may be 1, 4, 7 or some multiple of 7 days. For special cases temperatures of −40°, −15°, +40°, 70°, 90°, 100°, 105°, 130°, 180°, 250°, 300° and 350° C. are listed. Immersion in water may also be employed but it is not recommended because of its lack of practical significance (VDE 0308). Drying in the oven as a standard conditioning treatment might also be criticized on the same basis. In this country there has not yet been established a uniform conditioning environment for the testing of plastics.

4. Chemical reagents

In the establishment of test methods for plastics, it is general practice to treat the determinations of resistance to chemical reagents as special cases. Thus, the British Specification for Moulded Insulating Materials provides very broadly that the physical and electrical properties shall not be adversely affected by exposure to saturated steam at atmospheric pressure for 2 hours or by immersion in insulation oil at a temperature of 90° C. (or lower if service conditions warrant it) for 24 hours, but as far as resistance to other reagents is concerned, it states that this shall be a matter of mutual agreement between manufacturer and purchaser. However, in the tabulation of data on plastics for handbooks and manufacturers' bulletins, it is customary to include information on the resistance of these materials to strong and weak acids and alkalies and to the various classes of organic solvents, such as alcohols, ketones, esters, ethers, aliphatic and aromatic hydrocarbons, and animal, vegetable and mineral oils. It would be advantageous, therefore, to have recognized compounds and concentrations for use in these tests and a uniform test procedure to follow, so that data obtained on the chemical resistance of new plastics would be comparable with those in the literature for other plastics. The recommendations of the British Electrical Association for chemicals for the treatment of electrical test specimens (Table 7) and the German VDE Specifications 0250 and 0303 for testing the resistance of insulating materials to chemicals represent progress in this direction. VDE Specification 0303 mentions immersion in 25 percent sulfuric acid, exposure over saturated ammonia water, and spraying with salt solution as the principal reagents to be used. Other chemicals sometimes employed in these tests are transformer oil, miscellaneous oils, benzine, benzene, alcohols, varnishes, waxes and paraffin. VDE Specification 0250 for testing insulation on wiring prescribes the use of sulfuric acid of 1.024 specific gravity measured at 20° C., nitric acid of 1.285 specific gravity, hydrochloric acid of 1.10 specific gravity, 30 percent acetic acid, 5 percent aqueous ammonia solution and chlorine gas.

The resistance of commercial plastics to immersion in various media is considered in the Handbook of Chemistry and Physics[10] and in the October 1937 issue of the journal "Modern Plastics".[11]

A detailed discussion of the effects of chemicals on phenolic laminated products made with paper or cloth base is given by Riley.[12] Specimens measuring 1/4 × 1 × 3 inches were immersed in the reagents at room temperature and 140° F. A concentration of 20 percent was selected as representative of exposure to strong acids and alkalies and 1 percent for the weak solutions. The samples were examined for changes in weight and thickness and for the condition of the surface, laminations and edges. It was observed that canvas-base laminated, exposed to widely differing types and concentrations of chemicals and temperatures, showed a surprising uniformity in maximum increase in weight. This maximum for a laminated product containing 50 percent of resin was almost identical with that found for the resin itself. The author notes that in many instances the strength of the material is retained in spite of chemical attack which mars the surface appearance, and that the useful life of these products under industrial corrosive conditions may, therefore, be much greater than of other construction materials. Some interesting observations on the resistance of laminated plastics to salt water, oil and gasoline-benzene mixture have been published by Kraemer.[13] Strength tests after 8 months' immersion in an agitated 3-percent sodium chloride solution showed that the paper base material had lost 12 percent of its original strength whereas the fabric base material had suffered no loss. Both fabric and paper laminated specimens when soaked in motor oil or a gasoline-benzene mixture for 10 days and exposed to the air for 3 days had lost no strength. Data on the change in weight and appearance of various transparent plastics when immersed in water, alcohol and kerosene for 7 days are reported by B. M. Axilrod and G. M. Kline.[8]

Conclusion

In the foregoing pages various methods in use for the determination of permanence properties and for grading plastics with respect to their behavior in service have been reviewed. The wide variations in the methods used in different countries for evaluating some of these properties have been noted. A critical comparison of the methods in use for the determination of other properties would be enlightening but is beyond the scope of this paper. However, it is very desirable that some effort be made to prevent needless confusion in the literature on plastics because of a diversity of test methods in use in various countries. A list of world organizations interested in the standardization of test methods for plastics and of publications issued by these bodies is given in Appendix I. The methods and data which these groups

[8] B. M. Axilrod and G. M. Kline, "A Study of Transparent Plastics for Use on Aircraft", J. Research NBS 19, 367–400 (Oct. 1937).
[10] "Properties of Commercial Plastics," Handbook of Chemistry and Physics, 21st Edition, Chemical Rubber Publishing Company, Cleveland, 1936.
[11] Plastics Properties Chart, Modern Plastics 15, insert 120–1 (Oct. 1937).
[12] H. E. Riley, "Effect of Chemicals on Phenol Resin Bonded Laminated," Ind. Eng. Chem. 28, 919–22 (Aug. 1936).
[13] O. Kraemer, "Synthetic Resins and Their Development for Airplane Structural Materials," Jahrbuch der Deutschen Versuchsanstalt für Luftfahrt, 1933, Part VI, 69–81.

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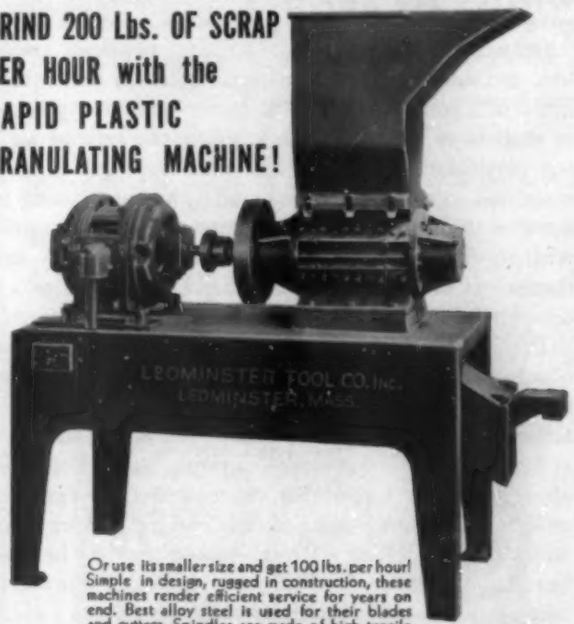

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have assembled should be helpful not only in studies of permanence but also in the investigation of test methods for chemical and physical properties of plastics.

APPENDIX I

World Organizations Interested in Standardization of Test Methods for Plastics

England:

British Standards Institution, 28 Victoria Street, London, S.W.1.

British Standard Specification for Moulded Insulating Materials Suitable for Accessories for General Electrical Installations, B.S.S. No. 488, 1933.

British Standards Institute Handbook of Information (Includes list of British Standard Specifications to July 1937. Supplements issued quarterly).

British Electrical and Allied Industries Research Association, 36 Kingsway, London, W.C.2.

Directions for the Study of Hard Composite Dielectrics (Mouldings, Sheet, and the Like), E.R.A. Ref. B/S3, published in the J. Inst. Elec. Engineers 81, 553–64 (Oct. 1937).

France:

L'Union des Syndicats de l'Electricité, 54, Avenue Marceau, Paris, 8e.

Liste des publications de l'Union des Syndicats de l'Electricité, Publication 1001, Jan. 1936.

Methodes d'essais sur les isolants moulés (1937 Ed.) C-46. Le Comité Supérieur de Normalisation, 43, Rue de Bellechasse, Paris, 7e.

Catalogue des Normes et Documents, 8th Ed., July 1937.

L'Association Francaise de Normalisation, 23, Rue Notre-Dame-des-Victoires, Paris, 2e.

Germany:

Verband Deutscher Elektrotechniker E.V., Bismarckstrasse 33, VDE-Haus, Berlin-Charlottenburg 4.

Vorschriftenbuch des Verbandes Deutscher Elektrotechniker, 1937 Ed.

Deutsche Normenausschuss, c/o Beuth-Verlag, Dresdener Strasse 97, Berlin SW 19.

DIN Normblatt-Verzeichnis, 1937.

United States:

American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa.

1936 Book of A.S.T.M. Standards, Part II, Non-Metallic Materials.

1937 Book of A.S.T.M. Tentative Standards.

American Standards Association, 29 West 39th Street, New York, N. Y.

List of American Standards, 3801, Feb. 1, 1938.

Standard Methods of Testing Molded Materials Used for Electrical Insulation, C59.1—1935 (Same as A.S.T.M. D 48-33).

The American Standards Association is a member of the International Standards Association with headquarters at Basle, Switzerland, and maintains a complete file of all standards approved by national standardizing bodies in all parts of the world.

JUNIOR ACHIEVEMENT

(*Continued from page 27*) because they are in much closer touch with the customer and are guided by his specifications. Frequently a client orders knobs and furniture pulls of cast resin to carry out a certain color scheme; others submit samples of drapes and ask for ash trays or escutcheons to match. One company equipped a yacht with cast resin ash trays closely following the customer's own design. Another filled an order for an intricate jig saw puzzle map of the United States in colored cast resin. At the present time some of the companies are experimenting with cast resin vases, lamps, and trim for furniture.

With offices and workshops tucked away in odd corners of many Eastern and Mid-Western cities and towns, are some 900 Junior Achievement Corporations, employing approximately 15,000 boys and girls. Besides becoming proficient in design and craftsmanship, members of these miniature corporations get their first taste of what it is to run a business and make a profit. In addition to being an employee in his or her own shop, each member is a stockholder and part owner in the business, participating in executive planning and responsibility.

The establishment may operate during the evening or on Saturday when the workers are not otherwise occupied with school or daily jobs; the place of business may be a portion of an office, the basement of somebody's home, a small section of a barn or, as in one instance, an abandoned swimming pool in a church. But whatever time is allotted to it, however small the working quarters, the organization of each corporation is complete with board of directors, president, secretary, treasurer, and production and sales managers elected from its own membership. Each unit adopts its own individual company name and is self-supporting, raising initial capital for tools and equipment by selling stock; each company pays rent, wages and oftentimes dividends on stock, purchases its own raw materials, markets its merchandise in its own community, establishes its credit and decides its policies of production and finance, guided and advised by three volunteer adults acting in the capacities of sponsor, craft instructor and business adviser, who in turn receive assistance from sectional headquarters established in metropolitan cities.

When a new company is organized, whether it is operated by boys, girls, or boys and girls together, the first important question to decide is the type of merchandise to be produced. Some companies choose leather goods, others work with wood or metal, while still others concentrate on decorative arts and needlework. However, they are not bound to stick to any one material or line of merchandise and when the demand for their original product seems to be satisfied, it is customary to transfer activities to new projects, requiring, perhaps, new materials and different methods of craftsmanship. At the present time, most of the work in plastic material is being done in New York City, but companies in other sections of the country are rapidly becoming interested in it and are seeking information concerning its characteristics and workability.

WINGS TO BEAUTY

(*Continued from page 31*) scopic, tasteless, odorless, and non-fugitive and answers perfectly the requirements of a good cosmetic container. The outer package or shell is of urea plastics and while the type of jar is not particularly new, the fact that the inner bowl is made in a soft Dawn Grey to match the outer casing instead of the usual white, it becomes unique in contrast with its ivory cover or closure. The colors easily lend themselves to modern interior schemes of decoration and complement the average woman's dressing table.

This happy combination of color was not an accidental occurrence. Months of experimenting were necessary before the exact tone and shade of grey were finally achieved, during which time tests were being carried on at Miss Cochran's laboratory to prove the serviceability of the container and similar experimentation was being undertaken by the plastic molder to give definite assurance that the molded materials would prove to be a perfect match in actual production. The use of this special tone of grey has been confined to Miss Cochran's exclusive use for a period of twenty years.

Lettering, which is used both as a decorative motif and for identification, employs the Anigraphic process, a medium for printing perfectly on a curved surface. This is especially interesting since the same process is also used on the glass jars—the effect is clean and delicately legible, becoming a part of the plastic container itself.

Miss Cochran has significantly adopted the slogan for her products—*Wings to Beauty*—and Mr. Loewy in draw-

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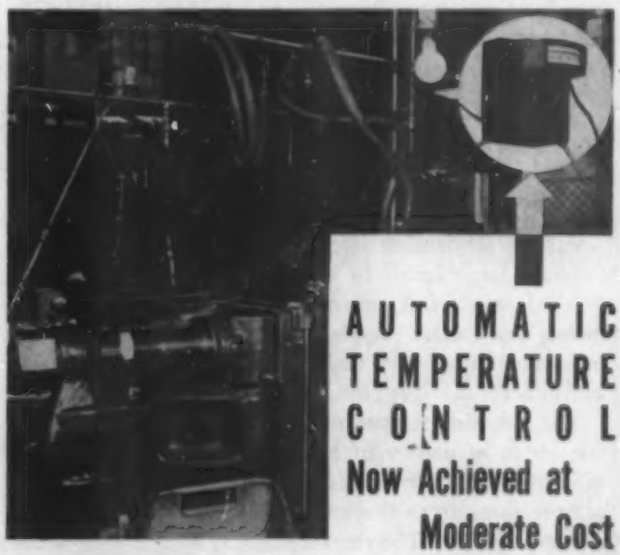

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ing his inspiration from aeronautics, uses sky-writing in the lettering to express this theme. As a further integration of ideas, one notes the symbol of the revolving aeroplane propeller as interpreted in the design of the jar and bottle caps and in the decorative motif used for the rouge and mascara containers.

The industrial designer, working today in versatile fields, has a world of new materials at his disposal—materials that lend themselves to original forms of expression. In one instance, glass may be the answer to his problems; in another case, stainless steel. Mr. Loewy, however, in designing this new family of packages has employed sheer glass, metal, and plastics. For the cream and rouge containers, he uses plastics for lightness, color, and stability; for liquids, he combines glass and plastics; and for some of the smaller items, such as lipstick and mascara, he selects for contrast the gleaming surface of polished metal.

In devising his plastic forms, Mr. Loewy uses designs that while intricate in appearance, require but two molds, an important item in manufacturing costs. In making use of plastic containers for creams, he takes advantage of the hollow-wall construction which provides a protective air space between the inner bowl and the outer casing which to a certain extent insulates the contents during either hot or cold weather, at the same time achieving a light weight package, easy to pack, inexpensive to ship, and unlikely to become broken during transit.

The public acceptance of Jacqueline Cochran cosmetics has been immediate and sincere. As an aviatrix she has won fame and many friends. As a manufacturer of cosmetics she indicates keen business perception in creating packages that lift her product to high esteem.

THE PROPERTIES OF AN IDEAL PLASTIC

(Continued from page 39)

Ease of fabrication is extremely important, being of course a large factor in keeping down the cost of the finished article. A turnery plastic must machine uniformly and easily. A plastic to be swaged, die-pressed or molded must work easily at reasonable temperatures and under reasonable pressures (*3*).

The softening temperature should be high to increase the range of utility of fabricated articles. The thermosetting resins are in general not seriously softened by temperatures up to those which cause discoloration and decomposition. The thermoplastics, however, do show definite softening temperatures, in many cases below 100 degrees C.

The molding temperature is desirably low, for obvious reasons of economy and comfort. With thermosetting materials the molding temperature is lower than the softening temperature of the molded article, but with thermoplastic materials the molding temperature is always definitely higher than the softening temperature, and the latter must sometimes be lowered undesirably, by the addition of plasticizer, in order to bring the molding temperature down to a practicable level. The interval between softening temperature and molding temperature should be small, particularly in compounds to be injection-molded (*4*). The ability to be softened considerably by increase in temperature beyond the nominal molding temperature makes possible corresponding reductions in molding pressure.

Strength should, obviously, be high, to make possible the fabrication of serviceable articles without excessive bulkiness and weight. Tensile strength is directly involved in the case of objects rotating at high speeds, such as spinning buckets and abrasive wheels, but for most uses of plastics a statement of tensile strength has little significance, since a tough and brittle material may exhibit the same value. What is really wanted in most cases is a maximum of that more complicated property "toughness," which it has been proposed to express in terms of a combination of tensile strength and percentage elongation (*5*), but which for most plastics purposes is effectively indicated by the impact test (*6*).

Impact strength, then, should be high. The test for impact strength is one of the most useful mechanical tests for plastics, and its further standardization as regards type of apparatus, dimensions of test specimen, absence or presence of notch and method of notching, would make the test of still greater value, particularly in the comparison of materials of different classes (*7*).

In safety glass interlayers, the maintenance of a protective toughness at extremes of temperature is very important. Both embrittlement by extreme cold and excessive softening at summer temperatures impair the protective quality of the composite glass (*8*).

Compressive strength, as measured under a load rapidly applied, is seldom of significance, because the compressive limit is seldom approached in actual service. Of much greater practical importance is any tendency of a plastic to become distorted by the prolonged application of a moderate compressive force, well below that which would have any permanent effect in instantaneous application. This tendency to cold flow should be as low as possible.

The modulus of elasticity has no optimum, since rigidity may be desired in some cases, pliability in others. Surface hardness should usually be as high as possible, so that the original finish will be resistant to abrasion. Lack of desirable surface hardness is a failing common to all organic plastics.

The index of refraction of a plastic used in transparent form is preferably high, as that is conducive to "brilliance." But complete absence of haze is of greater importance; thus polymethyl methacrylate is far more brilliant than a cellulose ester plastic having the same index of refraction. Percentage transmission of light in the visible spectrum is probably another factor in brilliance. Percentage transmission in the ultraviolet is seldom of direct importance, but it is true in general that a plastic which transmits actinic rays is correspondingly less subject to their damaging effects.

Complete absence of color in the base material is necessary if a complete range of colorations is required. Many plastic bases possess a yellowish tint which prevents the

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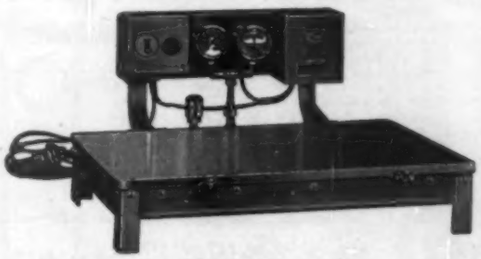

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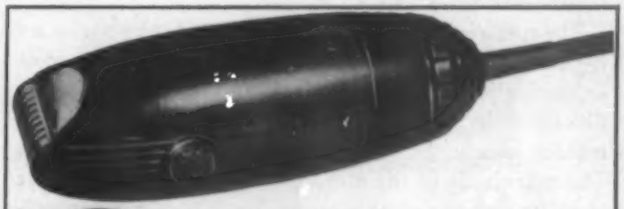

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production of a true water-white transparent and of pure tints, particularly blue. A perfectly clear and colorless base material is requisite to unlimited colorability.

Moisture absorption should be low, because absorption of water may cause warpage and changes in dimensions and also impairs electrical insulating properties. Furthermore, the plastic should contain no water soluble or water-sensitive ingredient.

Solubility in organic solvents should be a minimum and likewise liability to chemical attack, so as to minimize restrictions upon the use of fabricated articles in contact with such solvents; a plastic affected by dilute alcohol, for example, cannot be used for bottle closures. Practically speaking, of course, complete insolubility may put some limitations upon processes for preparing the plastic.

Odor and taste should be absent. This is mandatory in the case of plastics coming into contact with foodstuffs, beverages and cosmetics, and very desirable in most other cases. No ingredient should be extractable during prolonged contact with such products, nor should the plastic be capable of absorbing any ingredient of the latter.

The low thermal conductivity of the plastics as a class is of course responsible for their desirably warm feeling to the touch. The difference between highest and lowest thermal conductivity within the group is not usually of practical significance. Theoretically, a high thermal conductivity and low specific heat would be desirable through facilitating the heating and cooling operations involved in molding.

The coefficients of thermal expansion of the plastics are high compared to those of the metals. The coefficient of expansion is a factor in the mold shrinkage, that is, the difference in dimensions between the mold and the molded article, but other factors are present also (*9*). The magnitude of the mold shrinkage is less important than its uniformity over successive lots of a given material in a given mold. Within the usual limits, a low coefficient of thermal expansion is to be preferred as causing less warpage in pieces of irregular thickness and a better approach to constancy in dimensions of pieces of larger size.

As a class, the plastics are good electrical insulators. In probably a majority of applications minimum dimensions are established on considerations of mechanical strength rather than of values of break-down voltage or volume resistivity. For applications involving electrical insulating performance, high values of these constants are of course desirable. In other applications, and in some cases in the course of manufacture of the plastics, high resistivity may be a disadvantage through promoting the accumulation of troublesome static charges which attract dust. Dielectric constant is desirably high for some electrical applications (the construction of condensers) and desirably low for others. Power factor, when of importance, should be as low as possible. Absence of tracking is important in some electrical uses, that is, if arcing takes place across the surface, the surface should not thereby be made more conductive.

Permanence of properties under prolonged exposure to light and to high temperatures, as well as with simple aging, is important, particularly in such a use as safety-glass interlayer, where, however, some protection can be given by suitable selection of glass (*10*). Ignition temperature should be high and rate of burning low.

The foregoing generalizations are presented with the understanding that in an occasional specific use one or another of them may be contradicted. They constitute a description of the properties of an ideal plastic.

The selection, for a specific use, of one plastic from among the numerous available ones will depend in part upon the method of fabrication to be used, molding being usually the cheapest for large production, and essential if the article to be made is of complicated design, while machining methods are frequently more economical for small production, and are better adapted to production for prompt delivery, since they involve no delay for the design and construction of molds. The choice of a plastic will depend also upon the need of meeting the essential requirements of the specific use; certain characteristics will be mandatory, others of no significance.

Reference to the chart of properties of commercial plastics (*11*) will show the impossibility of finding all the desirable properties in a single material. Maximum strength may be had at moderate cost, but only at a sacrifice of water-resistance and of range of coloration. Excellent strength can be had in another material available in light translucent colors, but only at somewhat higher cost. The best water-resistance is coupled with unlimited colorability and outstanding electrical properties in a material of inferior strength and high cost, and so on. Thus, each of the commercial plastics offers a different combination of merits and deficiencies which determines its field of usefulness. There is, obviously, no plastic of ideal character or universal applicability.

(*1*) Note, for example, the tables of contents of Kausch, "Handbuch der kunstlichen plastischen Massen," Lehmanns, Leipzig (1931); and of Ellis, "The Chemistry of Synthetic Resins," Reinhold Publishing Co., New York City (1935).

(*2*) MODERN PLASTICS, Vol. 15, October 1937, p. 46.

(*3*) Considerable research has been done on methods of testing the flow properties of plastics in molds. See, for example:
Giornale di chimica industriale ed applicata, Vol. 5, p. 342 (1923).
Industrial and Engineering Chemistry, Vol. 21, p. 770 (1929).
Industrial and Engineering Chemistry, Analytical Edition, Vol. 1, p. 158 (1929).
Plastische Massen, Vol. 1, p. 104 (1931); Vol. 4, pp. 157, 189 (1934).
Elektrotechnische Zeitschrift, Vol. 14, pp. 439, 850 (1931).
USP 1,988,597.
Plastic Products, Vol. 10, pp. 53, 93, 132 (1934).
British Plastics Year Book, p. 68 (1933); p. 47 (1935).
British Plastics, Vol. 6, p. 54 (1934).
Physics, Vol. 4, pp. 225, 285 (1933).
BP 432,646.
Kunststoffe, Vol. 26, pp. 126–129 (1936).
Industrial and Engineering Chemistry, Analytical Edition, Vol. 8, pp. 185–188 (1936).
Kolloid-Zeitschrift, Vol. 75, pp. 142–154 (1936).
Kautschuk, Vol. 12, p. 9 (1936).
Wakefield and Schmidt, Paper presented before Society of Rheology, October, 1935.

(*4*) *American Machinist*, Vol. 79, pp. 623–624 (1936).

(*5*) MODERN PLASTICS, Vol. 15, October 1937, pp. 20–21, 69.

(*6*) Tentative Methods of Testing Electrical Insulating Materials for Resistance to Impact (D 256 – 34 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I, p. 995 (1934); also 1937 Book of A.S.T.M. Tentative Standards, p. 1023.

(*7*) Note lack of uniformity of practice in, for example, table of properties in MODERN PLASTICS, Vol. 15, October 1937, p. 120.

(*8*) Methods of test for safety glass are given in the Safety Code for Safety Glass for Glazing Motor Vehicles Operating on Land Highways (Z26.1-1935), Am. Standards Assn.

(*9*) Rahm, "Plastic Molding," p. 94, McGraw-Hill Book Co., Inc., New York City (1933).

(*10*) USP 1,467,030.

(*11*) MODERN PLASTICS, Vol. 15, October 1937, p. 120.
Lange, "Handbook of Chemistry," pp. 618–621, Handbook Publishers, Inc., Sandusky, Ohio (1937).

The author wishes to express his appreciation of the friendly advice of A. J. Weith and H. L. Bender, of the Bakelite Corp.

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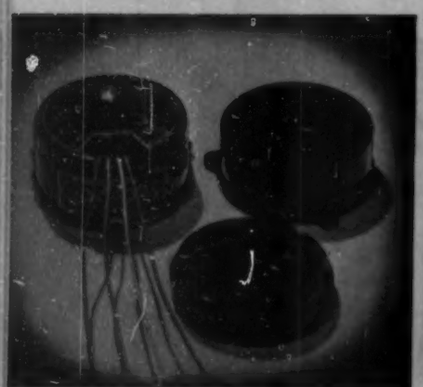

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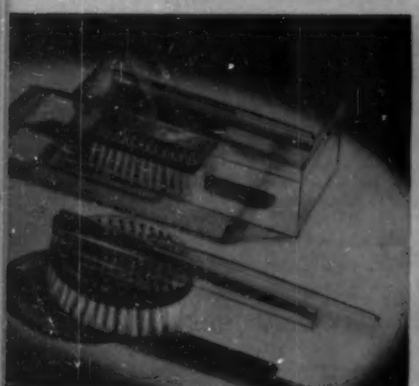

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1. Daylight film winder used to transfer 5 feet of photographic film from a 100 ft. roll to an enclosed cartridge which may be loaded into the camera in daylight. Winder is molded of Bakelite, which was tested to prevent light fogging of the film, by Kuhn & Jacob Moulding & Tool Company for Houtzdale Stamp Works

2. Banthrico coin bank with a calendar which changes when a dime is inserted. Injection molded of Tenite and Plastacele by Elmer E. Mills Corporation

3. The Barrett Figuring-Listing machine, weighs only 10 pounds and occupies space about one-half the size of a business letterhead. Molded of Textolite by the Plastics Division, General Electric Company

4. Dry-point etching on Plastacele consists of engraving on a sheet of plastic in the same manner as copper and printing directly from the inked plate to paper. The etching illustrated is of the Christian Science Temple and the artist is Pearl Anne Klein

5. Continuously calibrated resistance analyzer and indicator housed in a molded Durez case is announced by the International Resistance Company. The high dielectric properties of molded plastics are ideally suited for the manifold checking requirements of the analyzer

6. Three-piece Emerson Radio cabinet molded of Beetle by Associated Attleboro Manufacturers, Inc.

7. Crystal clear, two-in-one piece utility set is compact and easy to keep clean. The handle of the brush has a slot for the comb. Available in crystal with red, blue or green dots and trim from the Amerith Division of the Celluloid Corporation

8. Dean H. Holden designed this tubular plastic bracket which is so formed that the lamp fits snugly becoming part of the fixture. Tubular lighting has been successfully and efficiently installed in theater lobbies, night clubs, trains, etc. Molded of Plaskon by General Electric Company

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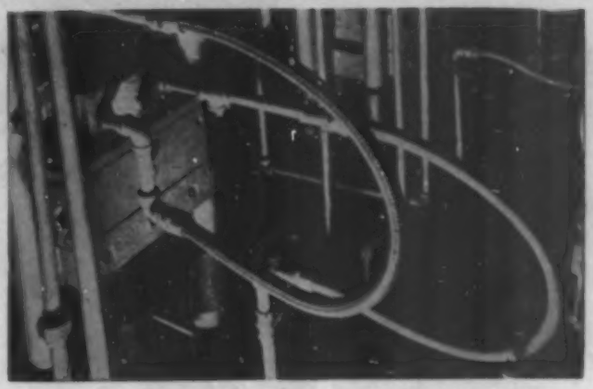

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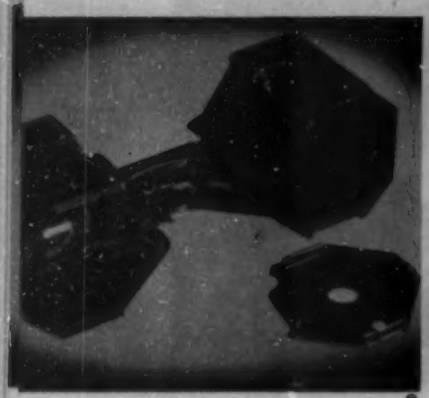

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9. Filmbook cartridges are molded of Bakelite by Northern Industrial Chemical Co. The lids are eccentric fastened and film may be sealed within the outer shell with sealing wax to prevent tampering. Molded plastics insure cooler film-reels, no tearing of film edges and smoother feeding

10. Goodlooking Zenith radio for your new car is injection molded of Tenite by Northern Industrial Chemical Company for Universal Controls Incorporated

11

12

11. Sanitary toothpick dispenser which when pressed down releases one toothpick at a time. No hands need to touch any of the picks. Molded for restaurant use by Universal Molding Company

12. Shave-Master is a colorful unit made of Fiberloid for Pro-phy-lac-tic Brush Co. It consists of a shaving brush suspended on an open cylindrical stand

13

14

13. Razorette is scientifically designed for women's shaving needs, and a quick dry shave. Two-tone molded plastic containers are supplied in black and white, red and white, light and deep blue, mauve and yellow, blue and white or green and white. Manufactured by the St. Clair Mfg. Co.

14. Tri Tap with three outlets for three flat caps or two standard round caps is molded of Bakelite for Eagle Electric Mfg. Co., Inc. Fastens to wall by a single screw and can be used for a table tap as well as a baseboard mounting

15

16

15. Liquefier Head for fertilizer container is molded by Harry Davies, Inc., for Gro-Lux, Inc. The chemicals contained in the fertilizers make plastic materials an ideal medium for a dispenser which will not deteriorate in use

16. Small moldings made by Stackpole Carbon Co. of Durez. Minute pilot pins and bushings withstand 50,000 cycles of operation, full shock of contact bar, act as insulating spacer and still do not show any appreciable sign of wear. Switch cases, one inch diameter and five-sixteenth inch deep are also molded

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